

## **Determination of Concentration of hazardous substances resulted from atmospheric emission from the Thermo Electric Central (TEC)**

According to the ruling of 7 March 2002 by Tbilisi Administrative District Court and the Tax Panel on the Administrative Case #3a/78 concerning the complaint of the residents of 4, Uznadze Street, Tbilisi, the Institute of Environmental Protection (I. Chavchavadze Ave., 75) has been asked to carry out chemical-technological, geological and psycho-physiological expertise and the experts have been asked to provide the explanatory report on the issues raised in the ruling:

1. What kind of hazardous substances are exhausted from the chimneys of TEC and whether they exceed the admissible norms? (in both regime of working – on mazut and on gas).
2. Are the filters installed on the chimneys and whether the heights of chimneys comply with the established norm? How much the reduction of height increases the emission of hazardous substances and the radius of emission?
3. Whether the conditions of exploitation, passport and limits of TEC comply with the international standards and Georgian legislation on ecological issues?
4. Are there any contradictions between the passport of the TEC and the ecological map of Tbilisi?
5. If the passport and limit of the TEC does not correspond to the established standards and legislation, did they have the right to start operation of the TEC? Why TEC is not exposed on the ecological map?
6. If the transformers (generators) explode, what kind of consequences is expected? (taking into account the radiation, wreckage and other factors)
7. According to the Guidelines adopted by the WHO in 1993 in Geneva, in the condition of modern technologies, the emission from chimneys of TEC and other similar objects consist of 5 types of substances (TSP, CO<sub>2</sub>, NO<sub>x</sub>, CO, VOC etc.). According to the limit of TEC only nitrogen dioxide is exhausted, and within the admissible norm. How this can be explained?
8. Do the noise coming from transformers (generators) and the emission of hazardous substances pose the threat to the life and health of residents of 4, Uznadze Street?
9. What are the value of the noise in decibel and other parameters of it, does the noise exceed the admissible level?
10. What kind of diseases can be provoked by the nose and the emission of hazardous substances? (including heavy metals)
11. What kind of gas is consumed by the TEC? What kind of elements does it consist of (nitrogen, sulfur, etc.) and what are the consequences of such composition?
12. What should be the distance between the TEC and residential area and is it recommended (prohibited) to have in exploitation the TEC in the distance as it is now with regard of living facilities? What kind of disease can be provoked from the cables of 35,000 Volt?
13. Are there any heavy metals in the emission from chimneys and what kind of impact they may have on the human health?

14. What should be the height of a chimney? What is the height of chimney indicated in the passport? What is a factual height of chimneys? Why did it become necessary two years ago to shorten the height of two chimneys? What is the consequence of cutting down the chimneys and of the height of two remaining chimneys to the environment and local dwellers?
15. According to the TEC documentation, for the total period of its exploitation, how many and what kind of accidents have happened at the TEC and what is the aftermaths of those accidents?
16. The administration of TEC in its counter-complaint against the residents of 4 Uznadze Street states that the air pollution is a result of location (low level) of the house and of intensive traffic. If it is so, why the same situation is not identified in other places along the River Mtkvari, which are located even at the lower level?

### Study

Calculation of quantitative and qualitative indicators can be conducted in two ways:

1. Direct instrumental measuring;
2. Theoretical or balanced method.

As five months have passed after receiving the case and they failed to launch the TEC (due to the local problems), the experts have failed to carry out direct instrumental measuring. We tried to identify the quantitative and qualitative indicators of emission on the basis of ecological passport and we have determined that the data given in the passport is considerably simplified and only nitric oxide is recorded, according to which its value is within the admissible norm. At the same time, such substances as CO, SO<sub>2</sub>, soot (although little, but its emission is evident) are not registered in the passport. Taking into account the fact that TEC has no sanitary protection zone and the minimum distance from the residential houses is about 50-60 meters, the whole “bouquet” of exhaust goes to the apartments, depending to the wind direction. The local dwellers are under the influence of emission. When calculating the hazardous substances we took into account the limit of 2001, according to which Tec consumes 266,000 m<sup>3</sup> gases a year. As they failed to trigger the operation of the TEC, although it was a request of experts, we have calculated the emission on the basis of literature for ideal burning of gas, which is far from reality as the performance index of the boilers of TEC are very low. Therefore, our results are considerably decreased in comparison with a real situation (because, in case of low performance index the incomplete burning is evident and concentration of carbonic acid in emission is higher). It is known from the literature that after burning the gas five substances can be found in emission: nitrogen dioxide, carbonic acid, sulfur dioxide, soot and evaporative organic substances. There is no sense to compute the value of soot and evaporative substances due to their small amount, but the value of sulfur dioxide and CO should be assessed taking into account the background, as the concentration of nitrogen dioxide is changing considerably the background. Based on this data (see attached УИРЗА ЭКОЛОГ ПРО, version 2.50 calculation) and taking into account the data provided by the Hydro meteorological Department of Tbilisi, which states that in 1999-2001 the admissible maximum value of nitrogen dioxide was 0.47. If we add to it

the data received through the software on emission of nitrogen dioxide by the TEC, which amounts 0.7 thus considerably changing the background, the sum  $0.47+0.7=1.1705$  exceeds the admissible value. This figure is the same for all apartments of 4, Uznadze Street. As for the calculation of emission of sulfur dioxide and CO, they amount to the maximum admissible value  $CO=0.6+0.0027=0.60027$  and  $SO_2=0.34+0.00049=0.34049$ . It means that the ratio of CO concentration with the maximum admissible value is 0.60027, and the ratio of sulfur dioxide with the maximum admissible value is 0.34049.

The maximum admissible values (concentration), in which the people live, take into account not only the negative impact on each substance to the human health, but also the overall toxicity. If the ratio of concentration is added to the maximum admissible value and it will be more than 1, then their toxicity is over the norm, though the each component is within the norm of maximum admissible value. (Encyclopedia on Labour Safety and Hygiene, issued by the ILO, Geneva, 1988, Vol. IV, Art. 3127-3131).

In our case the maximum admissible value of  $NO_x$  is 1.1705, for CO – 0.60027, for  $SO_2$  – 0.34049. In total – 2.111.

Toxicity of emission from TEC with respect of background is 2.111 that twice exceed the norm. This means that the residents of 4, Uznadze Street, during 24 hours, are under increased concentration of hazardous substances.

With regard of mazut, according to the ecological passport of TEC, in case of use of an average sulfur mazut, the concentration of nitrogen dioxide and of sulfur anhydride TEC chimneys exceed the norm and it amounts to 1.28 of the maximum admissible value. It is inadmissible to continue working with such kind of mazut and only a low-sulfur Mazut can be used. We haven't made a calculation in case of mazut consumption and rely on the data of ecological passport.

According to our calculation the dwellers of adjacent territory are under the permanent threat of pollution. The city authorities shall prohibit the operation of such enterprise, or remove it to the outside of the city, where it will have the protective sanitary zone.

### Conclusion

We respond the questions on Case 3a/78-2001 as follows:

Answer to Question 1: on the basis of ecological passport and limit four substances of emission - nitrogen dioxide, sulfur dioxide, CO and soot - have been calculated. Concentration of each of them does not exceed the maximum admissible level if we do not take into account the background value of pollution in Tbilisi, but as the background value is rather high in the city the exit gases change the background value and in sum their maximum admissible level exceeds the norm (2.111). Information regarding mazut is given in Research part of this document. According to ecological passport the concentration of nitrogen dioxide and of sulfur dioxide exceeds the norm when mazut is consumed and it amounts to 1.28 without background value.

Answer to question 2: it is evident from the ecological passport that there is no chimney filter installed. The height of chimney is indicated as 30.8 meters while in reality it is only 27 meters. This is a violation as the figures on pollution when calculating emission in the passport are reduced.

Answer to question 3: the location of TEC with regard of distance from residential area and absence of protective sanitary zone does not correspond to the international standards. As for compliance of ecological passport and limit with legislation, it is the issue of legal consideration.

Answer to question 4: those who have drafted the ecological map should give the answer why the TEC is not marked on the map.

Answer to question 5: answer to question 5 about passport and limits of “TEC” is referred in answer 3.

Answer to question 6: consideration of accidents in TEC is outside of our competence.

Answer to question 7: answer is given in the answer to question 1.

Answer to question 8: emission from TEC chimneys poses a threat to the residents of 4, Uznadze Street.

Answers to questions 9-10-11-12: these issues are outside of our competence.

Answer to question 13: the hazardous substances do not consist of heavy metals, irrespective of fuel (gas or mazut)

Answer to question 14: the same as for question 2

Answers to question 15-16: these issues are outside of our competence.

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