ASSESS THE LEVELS OF CONCENTRATIONS OF POLLUTANTS IN AMBIENT AIR IN THE AREA OF TURCENI POWER PLANT

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ABSTRACT: Energy production sector through the burning of fossil fuels represents the most significant weighting in the overall picture of the major polluters of the environment, be it of atmospheric pollution through the release of large volumes of greenhouse gases and acidifying, powders, whether we are talking about large amounts of waste or ash and slag deposits that occupy large areas of land. The paper presents an evaluation of the quality of environmental factors under the pollution generated by the work done within the Turceni and the impact of energy production on the air quality.

KEY WORDS: air, pollutants, power plant, energy

1. INTRODUCTION

One of the main issues, whose resolution is dependent on the development of our civilization, the issue returned to the forefront of the concerns of the people of science, is providing them with the necessary energy development activities that shape the progressive evolution of the standard of living of the globe's population. The most important question raised by the increase in energy consumption is necessary to achieve the growth of living standards of mankind is environmental impact by reducing supplies of fuel and raw materials strictly necessary, as the phenomenon of pollution, which must be strictly controlled to maintain a living environment without pollutants.

Energy is both a solution and a problem for sustainable development, because it makes it easier to progress, but it is also a major cause of pollution and other damage to health of humans and the environment. It was estimated that heating industry contributes to the overall pollution as follows: 75% of the dust pollution in rather large proportion with the gases SO_2, CO, CO_2, and almost entirely with carcinogenic hydrocarbons. To these are added in varying proportions: NO_x, As, phenols, aldehydes, ketones, organic acids. Power plants produce 80% of its electricity requirements and uses fossil fuels (solid, liquid, gas). Pollution produced as a result of combustion is closely linked to their composition. From a complete combustion particulates emitted results consist mainly of the ashes. These dirty grey and degrades the environment, it shall be deposited on vegetation, buildings, streets and give unpleasant aspect [1,2].

Sulphur oxides (sulphur dioxide and trioxide) resulting mainly from the burning of fossil fuels, from stationary and mobile sources. The presence of sulphur dioxide into the atmosphere over certain limits has negative effects on plants, animals and man. In plants, sulphur dioxide induces local lesions in foliar system, which reduces

photosynthesis. In humans and animals in low concentrations produce respiratory irritation, and in higher concentrations cause bronchial spasm. Furthermore, sulphur dioxide, carbohydrate metabolism disorders occur and enzymatic processes. Toxic effect of sulfur dioxide is accentuated by the presence of dust [3,4].

Nitrogen oxides cause humans, animals and plants, various conditions depending on the concentration. In high concentrations, nitrogen oxides diminishes photosynthesis. In humans and animals in low concentrations causing severe respiratory irritation, burns and dipping, violent coughing accompanied by yellow productive. At high concentrations occur severe symptoms of asphyxiation, convulsions and respiratory blockage [5,6].

In general all kinds have a respiratory irritant action, and specific action is related to their chemical composition. Dust and stability of sedimentable settle easily. Power diffusion is reduced, not entering the alveoli, so they are not dangerous to humans. Action on the flora have, however, negatively influencing photosynthesis in plants.

The main directions of the future in the field of energy-environment are:

- ✓ diversifying energy supplies through developing technologies more and more effective for pure fossil fuels;
- ✓ increase the share of renewable energy sources;
- ✓ development of technologies for the production of renewable energy, to increase the share of regeneration in the production and consumption of energy;
- ✓ assisting countries still dependent on fossil fuels for energy diversification. [7].

2. ASSESSMENT OF AMBIENT AIR QUALITY IN THE AREA OF TURCENI POWER PLANT

The main pollutant agents that affect air quality in the area of Turceni are represented by pollutants from flue gases emitted through smoke chimneys of the power station. Pollutants emitted into the atmosphere, contained in the gases resulting from the combustion of fuel along with the combustion air, boilers, outbreaks are: SO_2, NOx, CO_2, CO, unburned particles, dust and traces of heavy metals (Hg, As, Pb, Cr, Co, Cu, Mn, Ni).

For ambient air quality assessment at the level of the Gorj county they are placed three automated monitoring stations of industrial type belonging to the national air quality monitoring in accordance with the criteria laid down in Ord. No. 592/2002.

In the area of Turceni is located automated monitoring station GJ-3. Characteristics of a industrial type:

- ✓ evaluate the influence of industrial activities on the quality of the air;
- ✓ the radius of the representation area: 100-1000 m;
- ✓ pollutants monitored: SO_2, NO_x, CO, O_3, PM10, weather parameters.

Evaluation of nitrogen dioxide in the ambient air

In accordance with law No. 104/2011 on ambient air quality are prescribed hourly limit value (200 $\mu g/m^3$) (do not exceed more than 18 times in any calendar year), the annual limit value for the protection of human health (40 $\mu g/m^3$) and the alert threshold (400 $\mu g/m^3$). In year 2014 for nitrogen dioxide have not recorded overrun limit values for monitoring station GJ-3. In Figure 1 it presents the average hourly concentrations recorded variations in 2015 for pollutant NO_2.

Table 1. Statistical data NO_2 in 2014.

Station	The measured hourly average	Valid data (%)	No. samples exceeding the limit value (200 µg/m^3)	No. samples exceeding the alert threshold (400 µg/m^3)	Annual average (µg/m^3)
GJ-3	8111	92,5	0	0	22,26

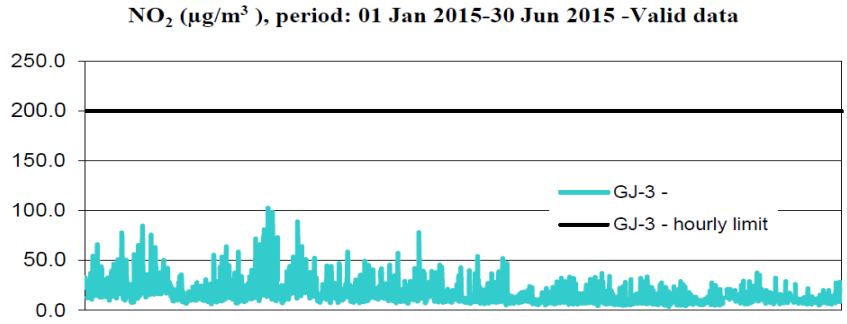

Figure 1. Average hourly concentration NO_2, 2015

Annual averages indicator for nitrogen dioxide at station GJ-3, Turceni is below the annual limit for protection of human health (40 µg/m^3).

Evaluation of sulphur dioxide in the ambient air

Law no. 104/2011 on ambient air quality are provided: hourly limit value (350 µg/m^3) (not to be exceeded more than 24 times in a calendar year), the limit/24 hours to protect human health (125 µg/m^3) and alert threshold (500 µg/m^3).

In Table 2, fig. 2 and 3 are presented statistical data of SO_2 recorded in 2014, respectively 2015.

Table 2. Statistical data SO_2 ,2014

Station	No. measured hourly	Valid data (%)	No. samples exceeding the limit value (350 µg/m^3)	No. samples exceeding threshold alert (500 µg/m^3)	Annual average (µg/m^3)
GJ-3	8105	92,5	5	0	13,36

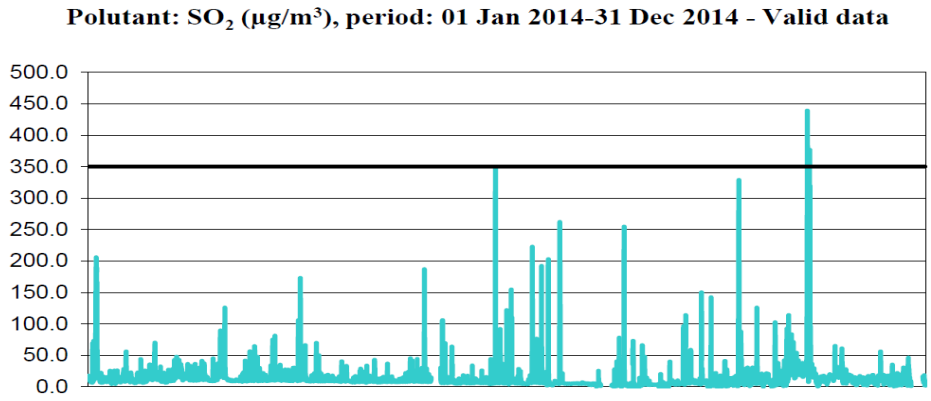

Figure 2. Average hourly concentration SO_2, 2014

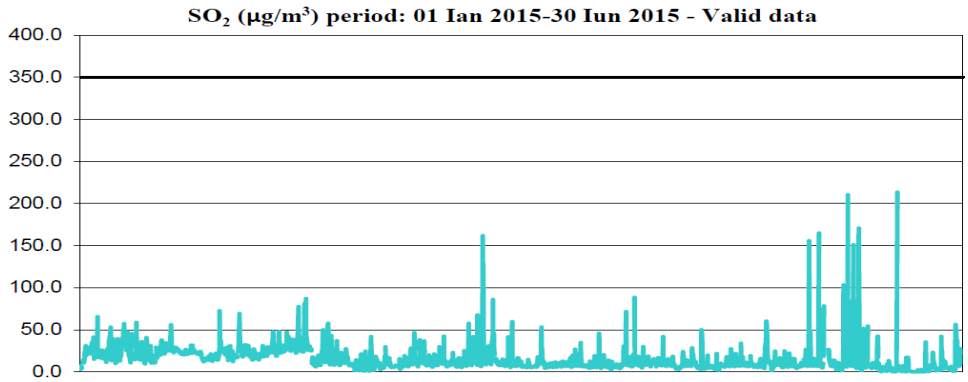

Figure 3. Average hourly concentration SO_2, 2015

At station GJ-3 were recorded five exceedings of the hourly limit value, the potential source is burning lignite SE Turceni SA which owns 4 large combustion plants on fossil fuels (lignite, fuel oil, NG) and has operated two plants for wet desulphurization of flue gas.

Exceedances recorded in the second half of 2014 were the root cause, the high demand for energy produced in power plants and frequent situations of atmospheric calm that favored persistent pollutants accumulate.

Evaluation of particulate matter (PM10 fraction)

Continuous monitoring was performed by gravimetric PM10 fraction station GJ-3. There were no more than 35 exceedances of the daily limit value for health (50 µg/m^3) / calendar year (Table 3 and fig. 4).

Table 3. PM10 – statistics, 2014

Station	Pollutant	No. daily average measured	Valid data (%)	No. samples exceeding the daily limit value (50 µg/m^3)	Annual average (µg/m^3)
GJ-3	PM10 automatic	275	75,3	9	16,67
	PM10 gravimetric	329	90,1	15	21,60

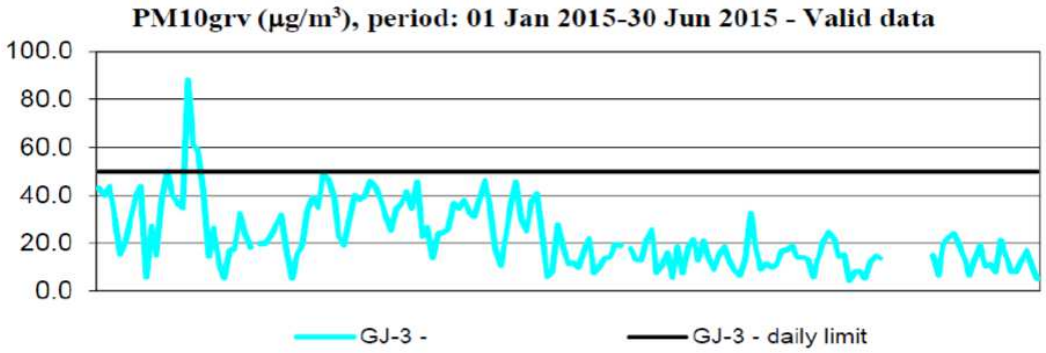

Figure 4. Gravimetric PM10, average daily concentration, 2015

Evaluation of carbon monoxide

Carbon monoxide resulting from incomplete combustion. Law no. 104/2011 on ambient air quality limit value is provided for a maximum 8-hour average (moving average), 10 µg/m^3 (Tab. 4). There were no breaches of this limit.

Evaluation of heavy metals

In order to determine the heavy metals and determinations were made of lead, arsenic, cadmium and nickel by the atomic absorption spectroscopy method, PM10 fraction of particulate matter collected on the filters in the stations automatic monitoring of air quality (tab. 5, fig. 5). No exceedances of the limit value (for lead) and target values (arsenic, cadmium and nickel) provided by Law no. 104/2011. In Table 6 is presented the situation of centralized air quality data for automatic station GJ- 3, 2014.

Table 4. Carbon monoxide – statistics, 2014

Station	No. measured hourly	Valid data (%)	Maximum 8-hour mean (µg/m^3)	No. samples exceeding the limit value (10 µg/m^3)	Annual average (µg/m^3)
GJ-3	131	1,4	2,26	0	*

Note: *The criterion is not met on the proportion of valid data necessary to calculate the annual average.

Table 5. Annual average heavy metals in the air, GJ-3, March 2014

Station	Indicatory	Number of samples	Annual average	U.M.	Limit value/target value (Law no. 104/2011)
GJ-3	Pb	329	0,0024	µg/m^3	0,5 µg/m^3 - annual limit value
	As	329	0,0116	ng/m^3	6 ng/m^3 - target value
	Cd	329	0,2459	ng/m^3	5 ng/m^3 - target value
	Ni	329	1,0740	ng/m^3	20 ng/m^3- target value

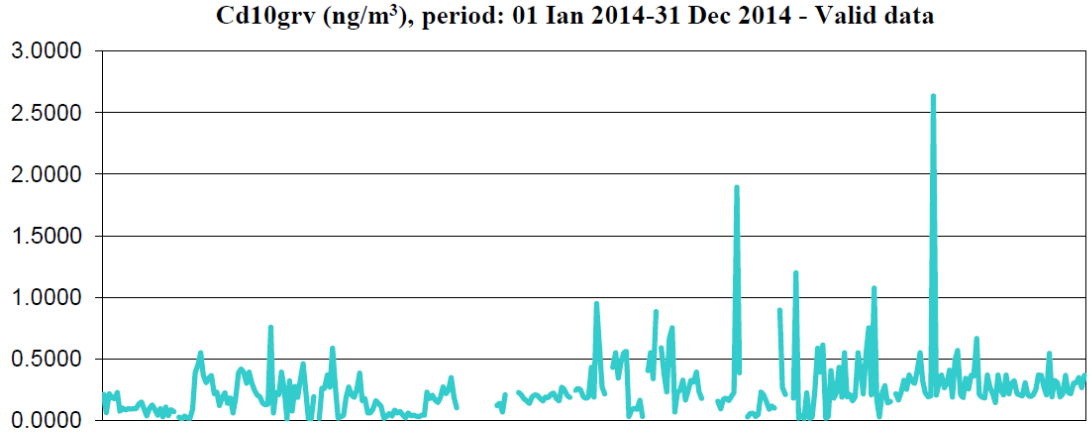

Figure 5. Average daily concentrations of cadmium, 2014

Table 6. The centralized air quality data for automatic station GJ- 3, 2014

Pollutant	Annual average	Measure unit	Type exceeded	No. overruns	Data capturing (%)
SO_2	13,36	µg/m^3	hourly limit exceeded / exceeded LV 24 hours	5 exceeding the hourly limit value	92,5
NO_2	22,26	µg/m^3	hourly limit exceeded	0	92,5
CO	*	µg/m^3	-	0	1,4
PM10 gravimetric	21,6	µg/m^3	exceeded LV 24 hours	15 exceeding LV 24 h	90,1
PM10 automatic	16,67	µg/m^3	exceeded LV 24 hours	9 exceeding LV 24 h	75,3
Pb	0,0024	ng/m^3	-	0	90,1
As	0,0116	ng/m^3	-	0	90,1
Cd	0,2459	ng/m^3	-	0	90,1
Ni	1,0740	ng/m^3	-	0	90,1

3. CONCLUSIONS

Energy consumption assumes power generation, an area which is a major source of air pollution.

The main pollutants emitted from combustion sources include: dust (fly ash, particles of coal, slag, dirt, soot etc.), sulfur oxides (SO_2 and SO_3); oxides of nitrogen (NO and NO_2); oxides of carbon, tar, hydrocarbons, organic acids etc.

Evolution automatic air quality monitoring parameters: sulfur dioxide SO_2, nitrogen oxides NOx (NO/NO_2), particulate matter PM10 and PM2,5, CO_2, CO, heavy metals indicated that pollutants in concentrations peak/environments at different mediation are found mostly near sources of emission main adverse weather conditions (cool atmospheric persistent and low speed wind and relative uniformity winds along main cardinal does not allow quick movement of pollutants in the zones where they are emitted).

In order to reduce the impact generated by the production of electricity in the Turceni Energy Complex aims to implement the Environmental Management System. In this regard:

- The company has defined an environmental policy, objectives, targets and programs;
- Annually develop action programs for environmental protection;
- Environmental issues are submitted annually to the governing bodies and determined improvements.

National systems of energy supply should focus their developments towards pluralism technology (part of nuclear power and renewables varied from

country to country) and for priority clean environment, quality and flexibility criteria technological choice.

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