STUDIES REGARDING THE PURIFICATION PROCESS OF THE USED WATERS AT S.C. SUINPROD S.A. TÂRGU-JIU

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ABSTRACT: In Romania, among the 78 operators submitted to the IPPC procedure, more than 40 are zootechnic farms having sizes higher than the minimum limit – The zootechnic activities constitute the main source of ammonium emission in the atmosphere and 75% of the emissions belong to this productive sector, the rest of 25% is due to the production and the use of fertilizers, to the processes of purification and waste administration, to certain industrial activities.

The hygienic-sanitary conditions of the farms may become the reason of certain limitations in their economical development, unless they are appropriately controlled, especially regarding the export to a community framework, with rigorous rules. This paper presents studies regarding the purification process of the used waters at **S.C. SUINPROD S.A. TÂRGU-JIU.** The indicators determined according to the valid STAS in 2012 are specific to some waters having a high organic charge, respectively: the matters in suspension, the biochemical oxygen consumption, the chemical oxygen consumption, ammoniacal and total nitric nitrogen and also phosphor. The chemical indicators that registered overflows of the limit values in all the analysed cases were: the matters in suspension, the chemical oxygen consumption, ammoniacal nitrogen and total nitrogen. The activity of intensive breeding of the swines has a significant impact on the environment by the gas emissions in the atmosphere (NH_3, CH_4), by the liquid effluents in the surface and underground waters and by the deposit on the soil.

KEY WORDS: purification, used, indicators, zootechnic, swines

INTRODUCTION

The supply of the necessary water, both biologically and technologically, is made of the 9 drillings existing in the complex area. The water is deposited into a reservoir having a capacity of 30 m^3, where the supply of every farm is made by free fall. Ecologically and sanitarily, the zootechnic farms [7] represent an important pollution factor, because of the emissions and of the liquid and solid waste.

The dejection evacuation from the halls is made by means of water and it occurs based on the level differences of the collecting channels. Each hall has 4 collecting channels for the dejections, all on a water pillow. The hall channels have a dam at the draining extremity, where the excess drains off during the population time of the halls. The hall channels converge to a central channel collecting all the waters containing dejections, leading them to the pumping station, and here they are sent, by means of two pumps, by a 500 m column to the wastewater treatment plant placed outside the complex.

The capacity of the wastewater treatment plant is 1023 m^3/day.

The purification of the used waters [1-6,10] resulted from the complex of pigs breeding is made by means of a mechanical-biological station. The installations of the wastewater treatment plant are the following:

- Grill and sieve hearth for keeping the gross bodies in suspension in the used water;
- Pumping station of the used water;
- Station with flat sieves;
- Longitudinal primary basin with a scraping bridge and two vats;
- Pumping station of mechanically purified waters;
- lagoon;
- aeration basin with active mud with aerators and air blowers;
- blower station;
- pumping station of active mud;
- biological ponds.

The gross bodies are kept by the grill and sieve installation in order not to get to the pumping stations. After keeping them, the used water is pumped to the wastewater treatment plant.

In the first phase, the wasters get to the drying beds by means of the pumps, after they had passed through a flat sieve system for keeping the floaters. The gross (solid) part is kept on the drying beds and the water is sent to the primary basin. This is longitudinal, it has a scraping bridge and its role is to keep the matters in suspension from the waters.

From the primary basin, the water is pumped into a lagoon in the soil, and the decanted part (the mud) is pumped to the drying beds. In the lagoon, the water stops for about 10 days and it suffers some natural processes of biological purification.

From the lagoon, the water gets to the aeration basins. Here, the water suffers a biological purification by means of the active mud proceeding, by an additional oxygen contribution which is introduced by means of blowers. In the biological step, there are the same purification processes as in the surface waters, but with a higher intensity, where, by means of the activity of certain microorganisms, there is the oxidation of the organic substances in the presence of the oxygen in the water. From the aerators, the water is pumped into the first pond and, after its filling, it follows the flow of the other three biological ponds to the evacuation into the emissary. This paper presents studies regarding the purification process of the used waters at **S.C. SUINPROD S.A. TÂRGU-JIU.**

EXPERIMENTAL

In this sense, we took samples and accomplished physical-chemical analyses of the water evacuated by SC SUINPROD SA complex, in order to see if the norms regarding their evacuation into the emissaries are respected, so that the downstream uses are not affected.

The physical-chemical analyses consisted of determining the specific indicators according to the valid STAS [9] in the year 2012 of some waters having a high organic charge, respectively matters in suspension, biochemical oxygen consumption, chemical oxygen consumption, ammoniacal and total nitric nitrogen and phosphor.

RESULTS AND DISCUSSIONS

In case of the indicators analysed for the evacuated water after it passes through the purification station, the results interpretation was made according to the stipulations of the Normative NTPA 001/2002,[8] approved by GD 188/2002, establishing the limits of polluter charging of the industrial and urban used waters at the evacuation into the natural receivers.

Based on the results obtained for each analysed indicator, there may be certain appreciations regarding the polluter charging degree of the used waters evacuated by SC SUINPROD SA.

The pH of the evacuated water presents values within the limits admitted by the

Normative regarding the evacuation of the industrial used waters into the natural receivers. Its values varied between 6.71 and 7.66 pH units.

For the matters in suspension, NTPA 001/2002 stipulates a limit for the evacuation of the industrial used waters into emissaries of 60 mg/L. By analysing the values obtained during a year, it is found that they were always overtaken and it is presented in figure no 1.

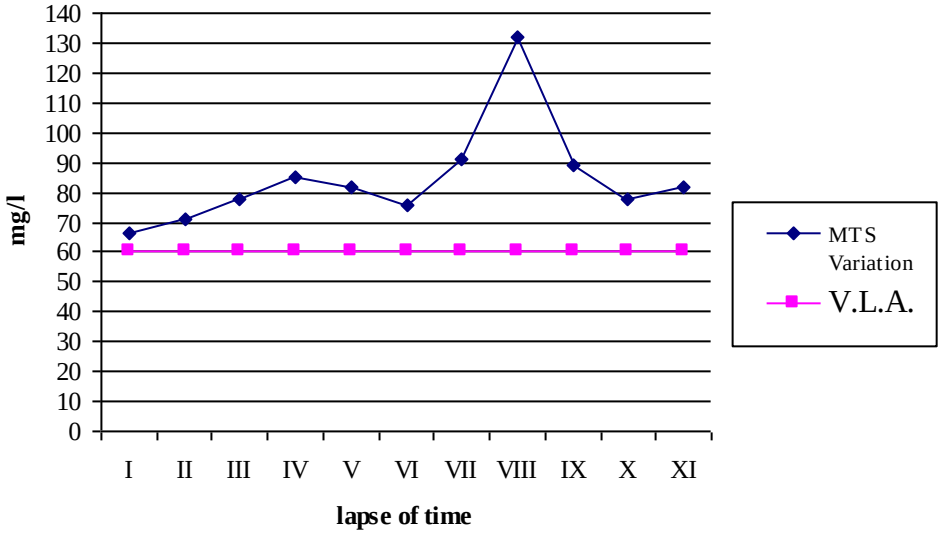

Figure no.1. Variation of the M.T.S. concentrations

The highest value for matters in suspension was registered in August (132mg/L), and it represented a 120% overflow of the value admitted at the evacuation.

In January, the lowest value was registered (66mg/L) and it represented only a 10% overflow of the admitted limit.

The rest of the values presented overflows situated between 18% and 51% over the admitted limit.

The admitted limit for the chemical oxygen consumption by the potassium bichromate method is 125 mg O_2/L and thus, in this case, we may find that the values obtained for the chemical oxygen consumption were always over the admitted limit. And this is presented in figure no.2. The highest concentration was obtained in August (254mg/L), and it was about twice over the admitted limit.

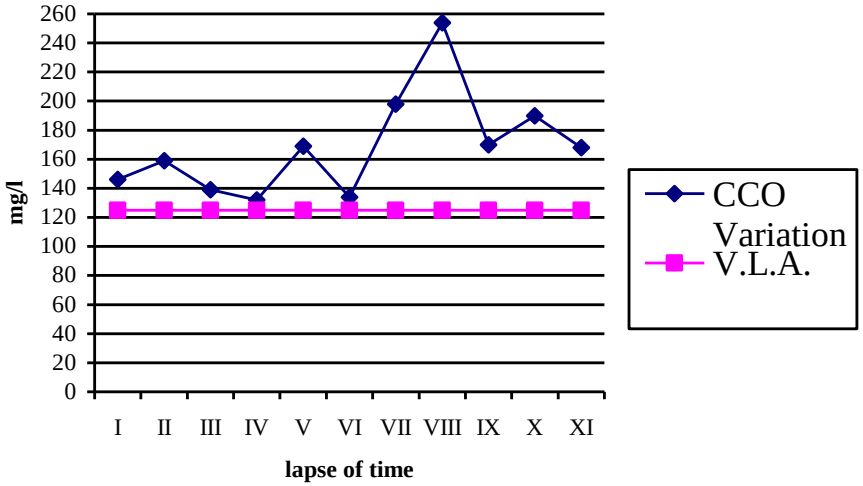

Figure no.2 Variation of the CCO_{Cr} concentration

By comparing the values obtained for CBO_5, with the admitted limit value, there are overflows of all of these.

The chemical oxygen consumption, together with the biochemical oxygen consumption, expresses the concentration of organic substances contained in water.

The biochemical oxygen consumption every 5 days (CBO_5) indicate the charging degree of a water with biodegradable organic matters and it is presented in figure no.3

The admitted value at the evacuation of the industrial used waters in the natural receivers is 20mg/L for this indicator. By comparing the values obtained for CBO_5, with the admitted limit value, there are overflows of all of these.

Thus, in July-August, the highest values were registered, and the maximum concentration was measured in August (123,5 mg O_2/L), as it meant about 6.2 times the admitted limit value.

The lowest concentration for CBO_5 was registered in April (57,9mg O_2/L), and it was 2.9 times higher than the admitted limit.

The fact that the values obtained for CBO_5 were above the admitted limit, it means that the biological purification step, especially the active mud basins, it did not work at the capacity necessary for reducing the organic substance quantity so that it could be within the admitted limits.

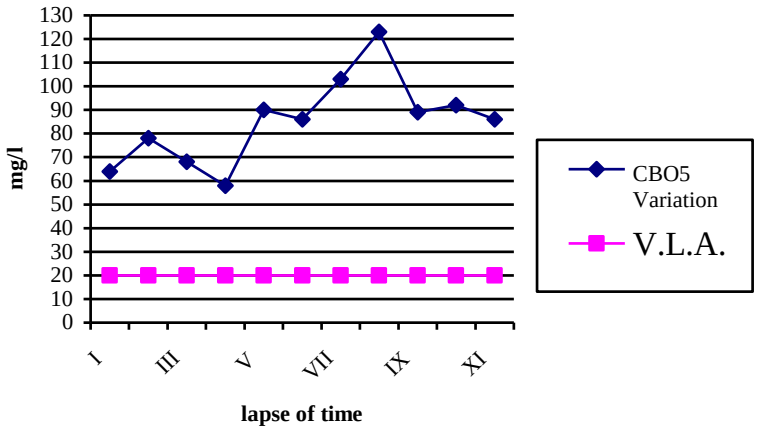

Figure no.3 Variation of the CBO_5 concentration

For the biological treatability of used water, the CBO_5/CCO report is important. The values of the CBO_5 /CCO<0.4 report indicate used waters with a high content of hardly biodegradable substances.

We may find that, in all the analysed cases, the values of the CBO_5/CCO_{Cr} report were 0.4 times higher, which indicates biologically treatable used water.

For ammoniacal nitrogen, NTPA 001/2002 stipulates a 2.0 mg/L limit concentration admitted at the evacuation into natural receivers. Among the three compounds of the nitrogen which are present in the evacuated used water (N-NH_4, NO_2 and NO_3), the ammoniacal nitrogen is presented in the highest concentrations.

Therefore, the highest concentrations were registered in the lapse of time with the highest temperatures. The highest concentration of ammoniacal nitrogen was in October (24,5 mg/L), which corresponds to an 12 times overflow of the admitted limit and this is presented in figure no.4.

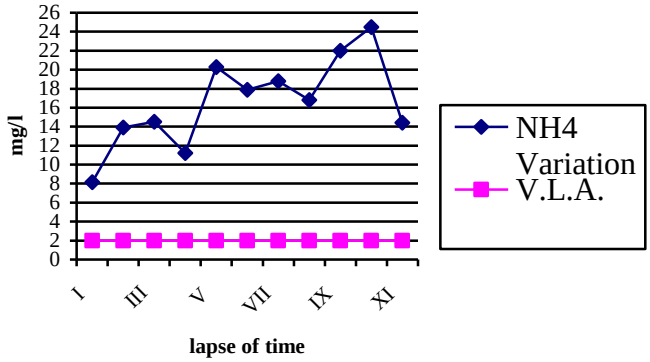

Figure no. 4. Variation of the NH_4 concentration

The lowest concentration was measured in January (8.15 mg/L), and it represented a 4 times overflow of the limit value.

The nitrites present a 2.0 mg/L limit value admitted for the evacuated water. All the concentrations obtained for the nitrites are placed under the admitted limit value. The highest values of the nitrites were registered in the months with the highest temperatures when the decomposition processes of the organic substances develop with a higher intensity.

The highest nitrite concentration was registered in October (0.96 mg/L) and it represented 48% of the limit value admitted at evacuation.

The lowest concentration was registered in March (0.18mg/L) and it represented only 9% of the admitted value.

For the nitrates, all the obtained values were under the admitted concentration. The highest nitrate concentrations were obtained in the lapse of time when the temperatures were the highest.

Therefore, the highest value was registered in May (12.6 mg/L) and it represented only 50.4% of the admitted limit, and the lowest one was obtained in February and it represented 28% of the admitted limit value.

The admitted limit for the total nitrogen at the evacuation of the used waters into the natural receivers is 10mg/L. Nitrogen, together with phosphor, which are both present in the surface waters above certain limits, contributes to the emergence of the water eutrophication phenomenon. This is manifested by the excessive development especially of some green algae which may lead to the asphyxiation of the organisms in the water. All the values registered for the total nitrogen in the water evacuated by SC SUINPROD SA were above the admitted limit.

The lowest concentration obtained after the accomplished measurements was registered in June (24.2 mg/L) and it was 2.42 times higher than the admitted limit.

The lowest concentration was registered in January (12.8mg/L), and it was 1.28 times above the admitted limit.

For total phosphor, the limit value admitted at the evacuation of the industrial used waters into the natural receivers is 2 mg/L.

Unlike nitrogen, in case of phosphor, the overflows frequency was 45.5%. The variation of the total phosphor concentrations in the evacuated used water is present in the indicators table.

The highest concentration of total phosphor was registered in November (4.1mg/L) and it was 2.05 times above the admitted limit value.

The lowest concentration was registered in February (1.21 mg/L), representing 60.5% of the admitted limit value.

CONCLUSION

- The purification of the used waters at S.C. SUINPROD Târgu-Jiu is made by means of a mechanical-biological installation and the biological treatment is made both by the active mud proceeding with air instilling and by the anaerobic one, by means of the biological ponds.

- The chemical indicators that registered overflows of the limit values in all the analysed cases were: the matters in suspension, the chemical oxygen consumption, the ammoniacal nitrogen and the total nitrogen.

- The highest overflows, in report to the admitted limit values, were registered for the ammoniacal nitrogen (NH_4), as it is 4 to 12 times above the admitted limit for this indicator. This

indicates a weak air (oxygen) supply of the aerators, therefore an incomplete damage of the organic substances.

- The lowest concentrations reported to the limit values were registered for nitrites and phosphor. Phosphor and nitrogen constitute determinant factors for unleashing the eutrophication phenomenon of the surface waters. This is why their contribution to the surface waters should be limited.

- The pollution of the environmental factors in case of the intensive swine breeding may emerge in all the phases of the technologic process.

- A series of polluters resulted from the activity of swine breeding (especially N and P), may also get indirectly to the surface waters, from the soils where animal dejections had been applied in an agronomic purpose. Thus, important quantities of phosphor and nitrogen are transferred to the waters.

- For applying the measures of reducing the environmental pollution by the activity of swine breeding, we should consider the local and specific factors of the placement and also the technical/economical feasibility of introducing new technologies.

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