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COMPARATIVE STUDY OF SURFACE WATERS POLLUTION BY SLAUGHTERHOUSES WASTEWATER

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Abstract: one of the pollution sources for the surface waters is represented by slaughterhouses wastewater. This study; performed at two such units; showed that wastewater treatment was insufficient; even if one of these slaughterhouse was provided with a modern wastewater treatment plant. Analyses of water samples collected from the region of the outflow into surface waters showed exceedings of the admissible limits for total suspensions; pH and ammonium. Exceedings were more important in the higher capacity slaughterhouse; leading to a more significant pollution potential.

INTRODUCTION

Wastewaters from slaughterhouses have a high pollution potential (Finnish Environment Institute; 2002; Masse and Masse; 2000; Paszkiewicz; 1999). This potential acts; depending on the outflow place; on the sewage networks (Borda et al.; 2002) or on the surface waters (Borda et al.; 2005). Even if the number of slaughterhouses has been considerably decreased comparatively to the 90's situation; there are still enough of such units evacuating important quantities of wastewaters (Borda; 2007).

This paper presents a comparative study between two slaughterhouses; regardind the effect of outflowed wastewaters on surface waters.

MATERIAL AND METHODS

Research was performed at two units; A and B. Slaughterhouse A; situated in Cluj county; slaughtered a mean number of 25 cows and 120 pigs/month. Wastewater treatment was provided in a settling tank with three compartments; wherefrom the water was evacuated into a rivulet. Slaughterhouse B; situated in Alba county; was meant for poultry slaughtering; with a maximal capacity of 24000 tones/year. Wastewater; once treated in a modern mechanical-biological treatment plant; was also evacuated into a rivulet.

Three water samples have been collected for each of the slaughterhouses; from the region of outflowing into the surface waters.

Samples have been analysed in the Hygiene and Environmental Protection Laboratory from the Faculty of Veterinary Medicine Cluj-Napoca and in the laboratory of „Romanian Waters" National Administration; Someş-Tisa Waters Department Cluj-Napoca. The next parameters have been determined:

- total suspensions: centrifugation method;
- conductivity: with electronic conductivity-meter (Conmet 1; Hanna Instr.);
- pH: with electronic pH-meter (Checker 1; Hanna Instr.);
- dry matter: at 105 ^{o}C; after centrifugation;

- ammonium: by distilation;
- biochemical oxygen demand: Winkler method;
- total number of aerobic mesophilic germs (TNAMG): with nutrient agar;
- most probable number of total coliforms and fecal coliforms: the multiple test tubes method (lactose broth for the presumptive test; Levine medium for the confirmation of total coliforms and briliant bile broth for the fecal coliforms confirmation).

RESULTS AND DISCUSIONS

The results of the analyses are represented in the following table:

Parameter	**Slaughterhouse**	**Sample**		
		1.	**2.**	**3.**
Total suspensions (mg/L)	A	80	30	1234
	B	-	532	3000
Conductivity (μS/cm)	A	670	480	635
	B	1038	1239	1047
pH	A	7.82	8.04	7.50
	B	4.94	4.43	6.04
Dry Matter (mg/L)	A	497.82	423.52	717.02
	B	525	647.05	520
Ammonium (mg/L)	A	14.83	3.95	6.28
	B	18.15	12.20	14.40
BOD_5 (mg O_2/L)	A	19.25	7.22	18.15
	B	12.10	8.45	14.90
TNAMG (cfu/mL)	A	4000	1040	57;500
	B	6775	1103	5800
Total coliforms (MPN/100 mL)	A	22;100	17;200	91;800
	B	16;090	3300	7900
Fecal coliforms (MPN/100 mL)	A	22;100	10;900	27;800
	B	16;090	3300	4900

From results analyses; the followings are observed:

- the outflow values are higher in the case of B slaughterhouse for the next parameter: total suspensions; conductivity; dry matter (for two determinations); ammonium; TNAMG (for two of the three determinations);
- concerning pH; BOD_5 (for two of the determinations); total and fecal coliforms; the values at the outflow into the surface water have been smaller in the case of B slaughterhouse.

Comparing the results to the Normative for determination of the pollutants loading limits in the industrial and municipal wastewaters at the outflow into natural receptors (NTPA-001/2002); the followings are observed:

- the total suspensions overstepped the maximal admissible limit by the normative for two determinations; for both A and B slaughterhouses (figure 1.a. and 1.b.);
- the pH outstepped the lower admissible limit in the case of B slaughterhouse; for each of the three determinations (figure 2.) (Borda; 2007);
- the ammonium overstepped the admissible limit at both slaughterhouses; for all determinations (figure 3.a. and 3.b.).

Fig. 1.a. Total suspensions - overstep of the admissible limit
at slaughterhouse A

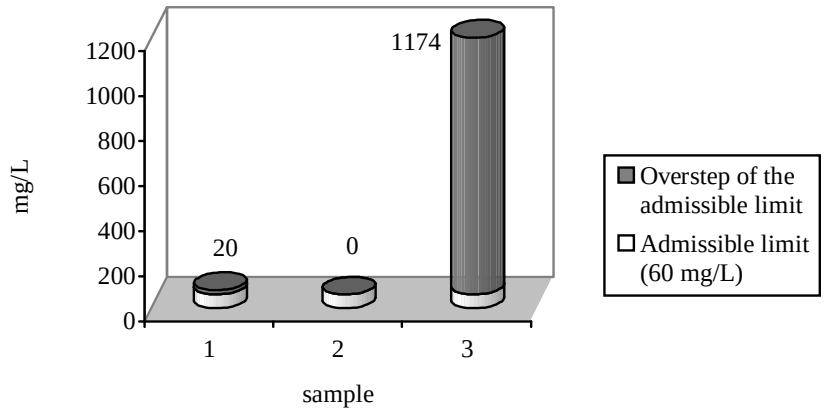


Fig. 1.b. Total suspensions - overstep of the admissible limit
at slaughterhouse B

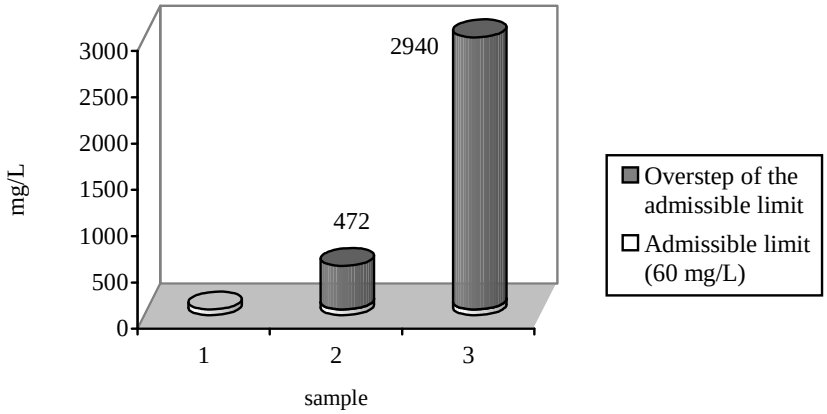


Fig. 2. pH - outstep of lower admissible limit
at slaughterhouse B

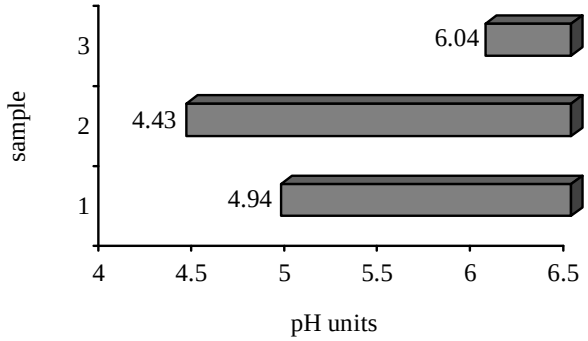


Fig. 3.a. Ammonium - overstep of the admissible limit
at slaughterhouse A

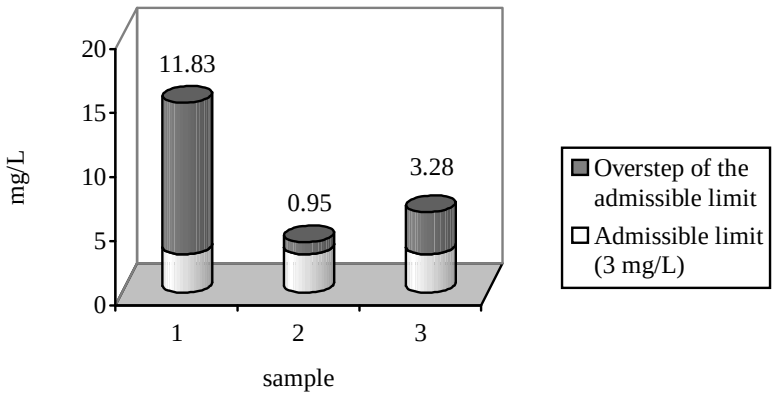
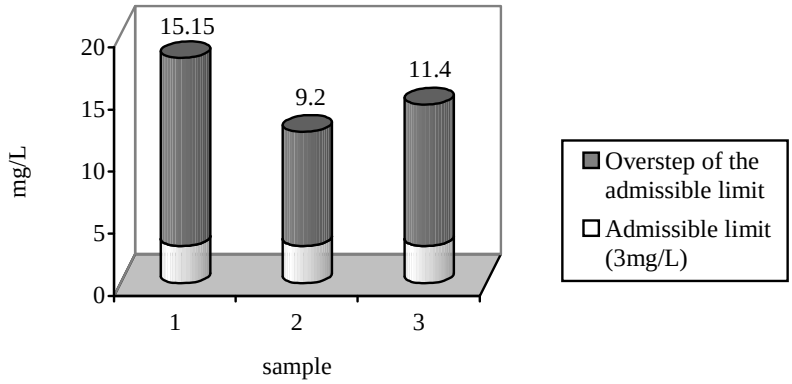


Fig. 3.b. Ammonium - overstep of the admissible limit
at slaughterhouse B



CONCLUSIONS

The registered values at the wastewater outflow into surface waters generally have been higher at B slaughterhouse comparative to A slaughterhouse (excepted BOD_5 ; pH and coliforms number).

Both slaughterhouses generated surface waters pollution; with remark that B slaughterhouse represented a more important pollution source because of the outflowed wastewater volume and of the pH values.

BIBLIOGRAPHY

1. Borda C.; C. Drăghici; Silvana Popescu; 2002; The pollution characteristics of wastewater from some slaughterhouses in Cluj-Napoca (Romania); In Proceedings of the 10th International Conference of the FAO European System of Cooperative Research Networks in Agriculture (ESCORENA) "Recycling of Agricultural; Municipal and Industrial Residues in Agriculture Network"; 14-18.05; Strbske Pleso; Slovacia; 451-454.

2. Borda C.; C. Drăghici; Daniela Borda; 2005; The polluting effect of slaughterhouse wastewaters discharged into surface waters; In Proceedings of the 12th International Congress ISAH; 4-8. 09.; Warsaw; Poland; 255-258.
3. Borda C.; 2007; The efficiency of a slaughterhouse wastewater treatment plant and their pollutant potential; In Proceedings of the 13th International Congress in Animal Hygiene; 17-21.06.; Tartu; Estonia; 952-956.
4. Borda C.; 2007; Apele reziduale de la abatoare-caracterizare; potențial poluant; metode de epurare. Ed. Napoca Star; Cluj-Napoca; 122 p.
5. Finnish Environment institute; 2002; Finnish Expert Report on Best Available Techniques in Slaughterhouses and Installation for the Disposal or Recycling of Animall Carcasses and Animal Waste; Helsingfors; Helsinki.
6. Masse D.I.; L. Masse; 2000; Characterization of wastewater from hog slaughterhouses in Eastern Canada and avaluation of their in-plant wastewater treatment system; Canadian Agricultural Engineering; 42(3); 139-146.
7. Paszkiewicz W.; 1999; Obciazenie odplywow z rzezni substancjami biologicznymi i chemicznymi oraz proba ich organiczenia; Teză de doctorat; Universitatea Lublin; Polonia; 69-74.
8. XXX; 2002; Normativ privind stabilirea limitelor de încărcare cu poluanți a apelor uzate industriale și orășenești la evacuarea în receptori naturali; NTPA – 001; Monitorul Oficial al României; Partea I nr. 187 din 20 martie.