FAO European Cooperative
Research Network

RAMIRAN

Recycling of Agricultural, Municipal and Industrial Residues in Agriculture

Network Coordinator: José Martinez, Cemagref, Rennes (France)

RAMIRAN 2002

Proceedings of the 10th International Conference of the RAMIRAN Network

General Theme: Hygiene Safety

Štrbské Pleso, High Tatras, Slovak Republic
May 14 - 18, 2002

Edited by Ján Venglovský and Gertruda Gréserová

ISBN 80-88985-68-4

University of Veterinary Medicine
Research Institute of Veterinary Medicine
Hlinkova 1/A
040 01 Košice
Slovak Republic

THE POLLUTION CHARACTERISTICS OF WASTEWATER FROM SOME SLAUGHTERHOUSES IN CLUJ-NAPOCA (ROMANIA)

Cristin BORDA, Constantin DRAGHICI, Silvana POPESCU

University of Agricultural Sciences and Veterinary Medicine, Faculty of Veterinary Medicine, Hygiene and Environmental Protection Dept., Manastur st. 3, 3400 Cluj-Napoca, ROMANIA,
e-mail: cris_mv@yahoo.com

INTRODUCTION

After 1989, as a consequence to passing of the free market economy, in Romania had appeared many small slaughterhouses, which function independent or in association with meat processing factories. For instance, only in Cluj County, which has a population of 736 000 inhabitants and a surface of 6 650 km^2, exist 39 such as this small slaughterhouses. Even that this slaughterhouses were built and arranged on project basis, with legal functioning notifications, some design and built deficiencies leads to the obtaining of wastewater with large pollution potential for the environment and with risks for animal and human health.

The study made by us proposes to establish the main pollution characteristics of the wastewater, which result from such units, and also finding of some solutions for pollution decreasing.

MATERIAL AND METHOD

The researches were made in 4 slaughterhouses placed in Cluj-Napoca City area. All these are using as water source the potable water supply of the city.

A slaughterhouse: slaughtering a mean number of 55 animals/month (30 cattle and 25 pigs), and as a mean of primary treatment is using a decanter, which when we have made the study was not functional, being clogging. So that, the raw water is directly overfall in the city wastewater system!

B slaughterhouse: with a number of slaughtered animals of 50/month (45 cattle and 5 pigs) has as a primary treatment means a mud-settling tank, from which the water reaches in the wastewater system of the city.

C slaughterhouse: with a number of 236 slaughtered animals/months (147 cattle and 89 sheep) also has only a mud-settling tank as a mean of treatment. From this, the residual waters are periodically evacuated and transported to the treatment station.

D slaughterhouse: slaughtering a mean number of 450 animals/month (150 cattle and 300 pigs) has a mud-settling tank as a mean of treatment and from this, the residual waters are evacuated and transported to the treatment station.

The water samples were drawn, both from the evacuation from the slaughtering room (raw wastewater) and from the settling evacuation (settling wastewater).

In the case of slaughterhouse B the experience was repeated, the determinations were also been made after experimental coagulation. As coagulant substance was used aluminum sulfate 10% solution (3), in quantity of 1 ml/l. The time of action of this substance was 3-5 hours.

The physico-chemical determinations were: sediment, total suspensions, fix residue, pH, conductivity (conductibility), ammonium, chemical oxygen demand (COD-Mn), biological oxygen demand (BOD_5). The bacteriological determinations made were total number of germs (TNG), probable number of total coliforms and feces coliforms.

The methods used for determinations were those standardized in our country.

RESULTS AND DISCUSSIONS

The result data after the analyses are represented in Table 1 and 2.

Table 1. Physico-chemical characteristics

Parameter	Sample	Slaughterhouse			
		A	B	C	D
Sediment (mL/L)	RW	16	30	58	10
	SW	-	4	4.5	0.6
	D%	-	-86.66	-92.24	-94.00
Total susp. (mg/L)	RW	5420	10740	1413	3420
	SW	-	243	1023	2440
	D%	-	-97.73	-27.60	-28.65
Conductivity (µS/cm)	RW	557	830	1775	1420
	SW	-	1534	1759	2490
	D%	-	+84.81	-0.90	+75.35
Fix residue (mg/L)	RW	3600	282	1471	30133
	SW	-	226	484	3304
	D%	-	-19.85	-67.09	-89.03
pH	RW	7.84	7.81	8.70	7.33
	SW	-	7.30	8.17	6.45
	D%	-	-6.53	-6.09	-12.00
Ammonium (mg/L)	RW	15.32	13.93	96.01	53.70
	SW	-	15.80	81.00	81.49
	D%	-	+13.42	-15.63	+51.75
COD-Mn (mg/L)	RW	1235.40	966.10	5107.36	4700.80
	SW	-	237.45	1790.27	463.24
	D%	-	-75.42	-64.94	-90.14
BOD_5 (mg/L)	RW	1240.00	964.00	1900.00	2980.00
	SW	-	195.50	1412.00	414.00
	D%	-	-79.71	-25.68	-86.10

RW=raw wastewater; SW=settling wastewater; D%=percentage differences to RW

Table 2. Bacteriological characteristics

Parameter	Sample	Slaughterhouse			
		A	B	C	D
T.N.G. (CFU/mL)	RW	$404x10^2$	50,550	$212x10^4$	$395x10^4$
	SW	-	$601x10^2$	3793333	$1017x10^4$
	D%	-	+18.89	+78.93	+157.46
Total coliforms (nr./L)	RW	$265x10^4$	$5x10^5$	$109x10^5$	$17x10^5$
	SW	-	$17x10^6$	$>1609x10^5$	$21x10^6$
	D%	-	+3300.00	+1376.14	+1135.29
Feces coliforms (nr./L)	RW	$265x10^4$	$2x10^5$	$7x10^6$	$33x10^5$
	SW	-	$17x10^6$	$>1609x10^5$	$>1609x10^6$
	D%	-	+8400.00	+2198.57	+48657.57

Analyzing the results, regarding the physico-chemical characteristics, there can be finding the followings:

- **the sediment** is substantially decrease after settling;
- **total suspensions** are also reduced after settling, but they outturn the admitted norm for wastewater evacuated in the city water system, with 1706,66% in slaughterhouse A (4);
- **the water conductivity** form settlings increase, it can be explain by the accumulation in this waters of the water from the other parts of the slaughterhouse;
- **fix residue** present a decrease after settling, the values are between the normal limits;
- **pH is also in the limits admitted by the standard;**
- **ammonium** is between the normal limits for residual waters discharged in the cities water system;
- **COD-Mn** and **BOD_5** have increased values in raw water, but they reduce after settling, however in the case of slaughterhouse A, the maximum admitted limit is exceeded in the case of the both parameters with about 313%

Regarding the bacteriological characteristics it can be notice that:

- **Total number of germs** increase in the water from settlings, due to the fact that is proceeded from all sectors of the slaughterhouse, comparing with the raw one from the slaughtering room;
- **Probable number of total coliforms** and **feces coliforms** are increasing a lot in the settling water, due to the same reasons

  Even that the number of microorganism is very high, there does not exist established norms regarding this point of view, for the discharging of these waters in the city water system.

The determinations made before and after the experimental coagulation, in slaughterhouse B, lead us to the values presented in Table 3.

Table 3. Experimental coagulation

Parameter	U.M.	Sample		D%
		SW	After EC	
Sediment	mL/L	0.1	4	+3900
Total susp.	mg/L	960	203.33	-78.81
Conductivity	µS/cm	1530	1600	+4.57
Fix residue	mg/L	1720	1545.45	-10.14
pH		8.27	7.76	-6.16
Ammonium	mg/L	11.65	8.59	-26.26
COD-Mn	mg/L	50.05	45.41	-9.27
BOD_5	mg/L	46.60	42.10	-9.65
T.N.G.	CFU/mL	29800	2550	-91.44
Total coliforms	nr./L	$79x10^4$	$7x10^5$	-11.39
Feces coliforms	nr./L	$79x10^4$	$7x10^5$	-11.39

SW= settling wastewater; EC=experimental coagulation

There can be noticed the followings:

- a significant increasing of sedimentation after the using of coagulant substance;
- the decreasing of the values of all the others parameters (excepting conductivity), this values are inframed in the normal limits for the residual waters discharged in the cities water system;

- the significant decreasing of the total number of germs, and in a small proportion of the probable number of total coliforms and feces coliforms.

CONCLUSIONS

- even some of the characteristics of the residual waters are significantly decreasing after settling, the water which are discharged from the slaughterhouses have an increased pollution potential, especially regarding the microbiological charge, this results are confirming our previous researches (1,2);
- in the case of A slaughterhouse is necessary the urgent cleaning (declogging) of the mud settling tank, in the purpose of reduction of the made pollution;
- in the case of all slaughterhouses it is necessary the intensification of the settling processes, both by the optimal functioning of the settling tank, but especially by the use of some coagulant substances;
- introduction in the cleaning process of the chemical stage will be very useful.

REFERENCES

1. Borda C., Drăghici C., 2001: The pollution potential of raw wastewater from the slaughterhouses, *3rd International Conference of PhD Students*, Miskolc, Hungary, 13-19 august, 81-87.
2. Drăghici C., Borda C., Silvana Popescu, 1999: Eficienţa epurării primare a apelor de la abatoare mici şi puncte de sacrificare a animalelor, Simp. *Actualităţi în creşterea şi patologia animalelor domestice*, Cluj-Napoca, România, 21-23 oct., vol. XXV, 318-322.
3. Drăghici C., Teuşdea V., Silvana popescu, Borda C., 2000: Lucrări practice la Igienă, Ed. Osama, Cluj-Napoca.
4. XXX, 1997: Normativ privind stabilirea limitelor de încărcare cu poluanţi a apelor uzate evacuate în trţelele de canalizare ale localităţilor "NTPA-002", Monitorul Oficial al României, nr. 327din 25 nov.