DOUBLE SETTLING EFFICIENCY OF SLAUGHTERHOUSE WASTEWATER

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ABSTRACT

The wastewaters emerged as result of slaughterhouses activities present an important polluting potential. For their treatment, the slaughterhouses must have adequate harnessing. Because only one decanter could not provide an efficient treatment, we intended to determine the efficiency of a treatment system consisting of two basins. The analyses we made shown that all the physical, chemical and bacteriological parameters are significantly reducing their values. Thus, after the double settling, all the parameters are within the maximum limits admitted for the wastewaters emerged in the sewage system.
Keywords: *wastewater, slaughterhouse, efficiency, settling.*

INTRODUCTION

During the last 14 years, in Romania appeared many new slaughterhouses, after their activities resulting important quantities of wastewater. In Maramures county, which has a surface of 6304 km^2 and a population of 509,534 inhabitants, exist 22 such of these units. The Law of water in our country (Law no. 107/1996) does not allow emerging the raw waste waters from slaughterhouses. Many of these companies have only one decanter for the wastewater treatment. Our previous research show that a simple settling of these waters is insufficiently, because many parameters grow out of maximal limits even for the wastewater's evacuated in the sewage system of localities (Borda et al., 2002, 2003). In this study we tested the efficiency of wastewater double settling in one slaughterhouse.

MATERIALS AND METHODS

The slaughterhouse is located in Baia Mare town (Maramures county, NV Romania). The abattoir slaughters a mean monthly number of 50 cattle and 90 swine. The amount of the final meat products resulted is about 60 tones every month. For the cleaning of the wastewater, this slaughterhouse has two settling tanks. After the secondary settling, the water is evacuated in the sewage system of the town.

The samples were collected from four points: at the entrance and emergence of the primary and of the secondary settling tanks.

We made the following physical, chemical and bacteriological exams:

- sediment: with Imhoff cones;
- total suspensions: centrifugation method;
- conductivity: with conductivity meter;
- fix residue: fix residue at 105^o C, after centrifugation;
- pH: with electronic pH-meter;
- ammonium: by distillation;
- chemical oxygen demand: potassium permanganate method;

- biological oxygen demand: Winckler method;
- total number of mesophilic germs (TNMG): with nutrient agar;
- probable number of total coliform and feces coliform: the multiple test tubes method, with lactose broth for the presumptive test, and with Levine medium for the confirmation of total coliform and brilliant green bile broth for the confirmation of feces coliform.

RESULTS AND DISCUSSION

The results of the wastewater analyses are represented in Table 1 and 2.

Table 1. *Physical and chemical characteristics.*

Parameter	Sample			D%
	raw wastewater	single settling	double settling	
sediment (mL/L)	9.42	1.5	0.2	-97.87
total susp. (mg/L)	614.75	577	142.08	-76.88
conductivity (µS/cm)	501.25	1326.87	406.75	-18.85
fix residue (mg/L)	241.89	206.29	114.08	-52.83
pH	6.73	7.24	6.83	+1.48
ammonium (mg/L)	57.02	120.42	12.18	-78.63
COD-Mn (mg/L)	139.2	50.4	42.4	-69.54
CBO_5 (mg/L)	107	25.88	30.43	-71.56

Note: The results represent the average of the 4 determinations for each parameter.
D%= percentage differences between raw wastewater and treated wastewater.

Table 2. *Bacteriological characteristics.*

Parameter	Sample			D%
	raw wastewater	single settling	double settling	
TNMG (cfu/mL)	133,572	17,400	5,562	-95.83
total coliforms (no./L)	2,550,000	219,250	323,450	-87.31
feces coliforms (no./L)	2,550,000	219,250	228,700	-91.03

Analyzing the results, regarding the physical and chemical characteristics, there can be finding the followings:

- **the sediment** is significantly reduced even after the first settling;
- **total suspensions** is significantly reduced after the first settling, but they were greater than the maximum limit admitted to emerge these waters in the sewage system (300 mg/l). After the final settling the values are much lower than this limit;
- **conductivity** is significantly growing in the first decanter, as result of salts accumulations, but after the double settling, the values are reduced compared to the raw waste water;
- **fix residue** is half reduced, but only after the second settling;
- **pH** has non-significant variations during the treatment process, with values closed to neutrality;
- **ammonium** is doubling its level in the first decanter, exceeding the admitted emerging limit (30 mg/l). After the second settling it is significantly reducing, being lower than this limit;
- **COD-Mn** and **CBO_5** are significantly reducing after the first settling, being within the standard limits.

Regarding the bacteriological characteristics, it can be noticed that:

- **total number of mesophilic germs** is significantly reducing after the first settling, after the final settling the reducing percentage being close to 96%!

- **probable number of total coliform** and **feces coliform** are within the same trend, significantly diminishing after the first settling and recording a lightly growing in the last decanter (compared to the first one), due to the accumulation of the waste water from the administrative building.

CONCLUSIONS

By comparing the parameters obtained after double settling with the national standards for wastewater (NTPA-002) resulted that all parameters are set into the maximal limits established for the wastewater evacuated in the sewage system.

This treatment system with two decanters is efficient in this case, event if there are not used coagulant substances, improvements of it being not necessary.

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