EVALUATION OF THE WASTEWATER QUALITY INDICATORS IN DAIRY INDUSTRY

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Abstract

The composition and the chemical characteristics of the effluents generated by dairy industry are dependent on the type of product being processed, the production program, operating methods, design of the processing plant, the degree of water management being applied and subsequently the amount of water being conserved. The dairy industry is one of the largest source of food processing wastewater in many countries. The dairy pollutants are mainly organic and the dairy industry is not commonly associated with severe environmental problems, but it must continually consider its environmental impact.The researches were carried out in the year 2013, in 2 milk processing factories from Bihor County. The wastewater generated by the 2 milk factories was characterised before treatment at the plant. Also, were obtained data regarding the wastewater management.

Keywords: wastewater, dairy industry, quality, monitoring.

INTRODUCTION

Wastewater generated from dairy industry has distinctive characteristics that set it apart from wastewater generated by meat industry. Wastewater from meat industry contains high concentrations of suspended solids (SS), including pieces of fat, grease, hair, feathers, flesh, manure, grit, and undigested feed. The dairy industry is generally considered to be the largest source of food processing wastewater in many countries. As awareness of the importance of improved standards of wastewater treatment grows, process requirements have become increasingly stringent. Although the dairy industry is not commonly associated with severe environmental problems, it must continually consider its environmental impact, particularly as dairy pollutants are mainly of organic origin.

The dairy industry is characterized by the multitude of products and therefore production lines. Plants can have as few as one or two production lines or all of them (pasteurized milk, cheese, butter, etc.). Because dairy wastewaters are highly biodegradable, they can be effectively treated with biological wastewater treatment systems. Processing of food from raw materials requires large volumes of high grade water. All steps in the dairy chain, including production, processing, packaging, transportation, storage, distribution, and marketing, impact the environment. Owing to the highly diversified nature of this industry, various product processing, handling, and packaging operations create wastes of different quality and quantity, which, if not treated, could lead to increased disposal and severe pollution problems.

MATERIAL AND METHODS

The research was done in 2013, in 2 milk processing factories. The monitored food units are placed in Bihor County. Wastewater samples were collected and analysed before treatment at the plant. The untreated wastewater was sampled after the screening or settling of coarser solids. Screens and primary settling tanks are usually located at the inlet of wastewater treatment areas, and it is difficult to sample before that point. The following pollution indicators were analysed: chemical oxygen demand, biochemical oxygen demand, solid content, pH, chlorides, total nitrogen and phosphorus. Analyses were done according to methods outlined in G. D. 188/2002.

RESULTS AND DISCUSSION

Following the visits to the monitored food units were obtained data regarding the wastewater management. At one of the milk factory the wastewater produced are evacuated in sewerage systems (milk factory A). The other discharges the wastewater into surface waters (milk factory B).

In table 1 are presented the average quantities of wastewater (m^3/day) discharged by the monitored food units.

Table 1

Average quantities of wastewater (m^3/day) discharged by the milk factories

Monitored food units	Average quantities of sewage (m^3/day)	Technological wastewater (m^3/day)	Total discharged wastewater (m^3/day)
Milk factory A	1,38	15,035	16,415
Milk factory B	0,93	28	28,93

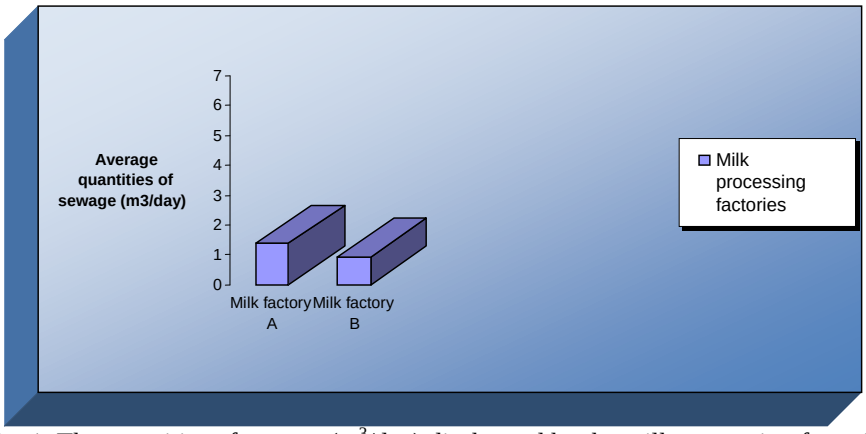

Fig. 1. The quantities of sewage (m^3/day) discharged by the milk processing factories

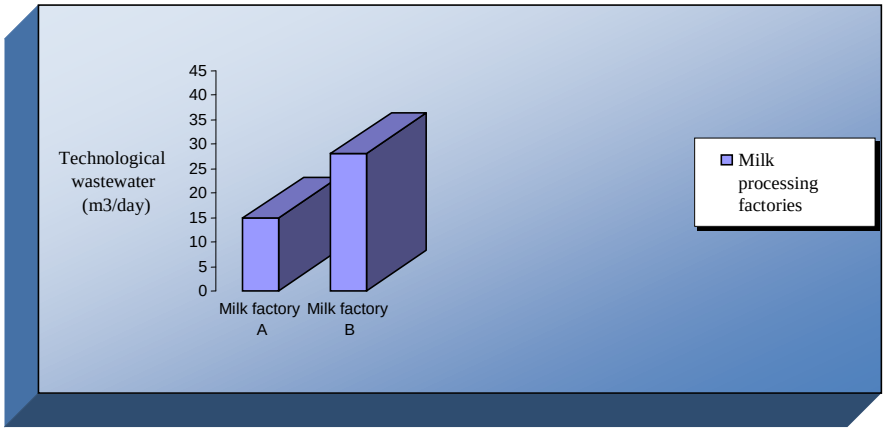

Fig. 2. The quantities of technological wastewater (m^3/day) discharged by the milk processing factories

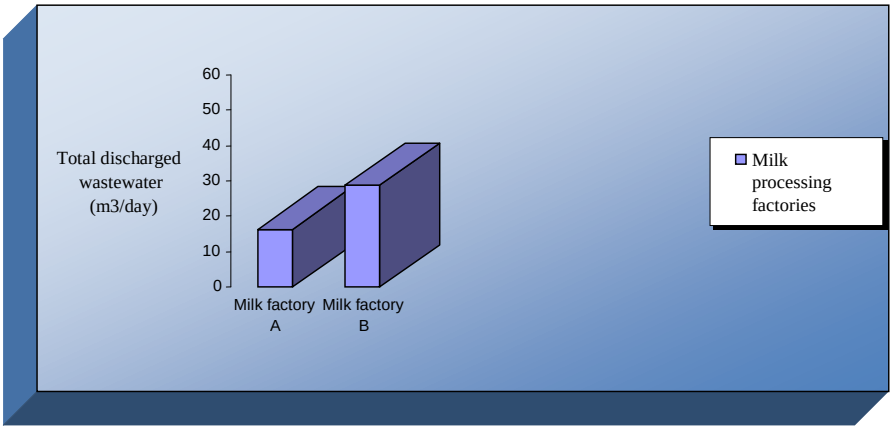

Fig.3. The quantities of wastewater (m^3/day) discharged by the monitored milk factories

The quantities of discharged wastewater depends by the drinking water consumption, production size, type of product being processed, the production program, operating methods, the degree of water management being applied, and subsequently the amount of water being conserved. The results presented in this research shows that the highest quantities of discharged wastewater were registered at “Milk processing factory B” while the lowest consumption was registered at “Milk processing factory A”. The “Milk processing factory B” is a large factory with high production until the “Milk processing factory A” is a small factory.

Table 2

The mean values of the pollution indicators of the wastewaters from "Milk processing factory A"

Pollution indicators	Unit of measure	Mean values
COD	mg/l	10251,2
BOD	mg/l	4840,6
Total suspended solids	mg/l	5802,6
pH	unit. pH	8,34
Chlorides	mg/l	616
Nitrogen	mg/l	663
Phosphorus	mg/l	153,6

Table 3

The mean values of the pollution indicators of the wastewaters from "Milk processing factory B"

Nr. crt.	Pollution indicators	Unit of measure	Mean values
1	COD	mg/l	1683,6
2	BOD	mg/l	863,4
3	Total suspended solids	mg/l	640,2
4	pH	unit. pH	8,02
5	Chlorides	mg/l	382,6
6	Nitrogen	mg/l	2743,6
7	Phosphorus	mg/l	328,4

The dairy sector uses phosphoric acid as one step in cleaning pipelines, storage tanks and processing equipment. One significant source of chlorides is the waste of sodium chloride from salting the food product. Cheese is salted by spreading salt on the curds or dipping cheese blocks in salt brine tanks.

CONCLUSIONS

Wastes from the dairy processing industry contain high concentrations of organic material such as proteins, carbohydrates, and lipids, high concentrations of suspended solids, chlorides, or high biological oxygen demand (BOD) and chemical oxygen demand (COD).

The highest quantities of discharged wastewater were registered at "Milk processing factory B" while the lowest consumption was registered at "Milk processing factory A".

ACKNOWLEDGEMENT

This paper has been financially supported within the project entitled ***"Horizon 2020 - Doctoral and Postdoctoral Studies: Promoting the National Interest through Excellence, Competitiveness and Responsibility in the Field of Romanian Fundamental and Applied Scientific Research",*** contract number POSDRU/159/1.5/S/140106. This project is co-financed by European Social Fund through Sectoral Operational Programme for Human Resources Development 2007-2013. **Investing in people!**

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