Short Communication / *Kısa Bilimsel Çalışma*

Detection of the important pollution parameters in dairy plants wastewater[*]

F. Seda BİLİR ORMANCI

Ankara University, School of Veterinary Medicine, Department of Food Hygiene and Technology 06110, Diskapi-Ankara.

Summary: The objective of this study was to investigate the main pollution parameters of wastewater in various dairy processing plants in Ankara, Çankırı and Kastamonu provinces. The wastewater samples were tested for BOD (Biological oxygen demand), COD (Chemical oxygen demand), TSS (Total suspended solid), FOG (Fat oil grease) and pH values before treatment whereas the samples from Çankırı province tested after treatment. The results indicated that pollution parameter levels of 60 wastewater samples of dairy industry tested in this study was found high. To avoid the environmental pollution and to protect public health, wastewater treatment systems are recommended for dairy industry.

Key words: BOD, COD, dairy industry, wastewater

Süt endüstrisi atıksularında önemli kirlilik parametrelerinin saptanması

Özet: Bu çalışmada Ankara, Çankırı ve Kastamonu illerinde, çeşitli süt işletmelerinin atıksularında, çevre kirliliği açısından önemli parametrelerin incelenmesi amaçlanmıştır. Toplanan örnekler Çankırı ilinde arıtma öncesi ve sonrasında, diğer illerde arıtma öncesinde BOİ (Biyolojik oksijen ihtiyacı), KOİ (Kimyasal oksijen ihtiyacı), AKM (Askıda katı madde), yağ-gres ve pH açısından test edilmiştir. Toplam 60 örneğin materyal olarak kullanıldığı çalışmada süt endüstrisi atıksularında, atık yükün fazla olduğu saptanmıştır. Ekolojik dengenin ve halk sağlığının korunması için, süt endüstrisinde atıksu arıtma sistemlerinin kullanılması büyük önem arz etmektedir.

Anahtar sözcükler: Atıksu, biyolojik oksijen ihtiyacı, kimyasal oksijen ihtiyacı, süt endüstrisi.

The discharge of wastewater to the environment without any treatment plays significant risk for public health and environmental pollution. The industrial wastes leads contamination of the water, soil and air when they are discharged without being subject to treatment or when they are treatment using inappropriate methods (4).

This study was undertaken to detection of the important pollution parameters in dairy plants wastewater.

A total of 60 samples of wastewater that were taken between February – November 2002 from milk enterprises located in the provinces of Ankara, Çankırı and Kastamonu have been used as the material in the study.

Biological oxygen demand of the wastewater samples were determined by the procedure outlined in the 17th edition of Standard Methods for the examination of water and wastewater (1)

The COD assay was conducted using the spectrophotometric procedure (1) with Nova 60 spectrophotometer.

The pH was determined using an Santex pH meter model TS- 2.

The gravimetric method (2) was used for the suspended solid matters.

The measurement of oil and grease was carried out with the partial gravimetric method (1).

The results obtained from the analyses of the wastewater samples prior to treatment are exhibited in Table 1, and the results obtained from the wastewater samples following the treatment in the active sludge pool are exhibited in Table 2.

In the study conducted on the role of the factory wastewater on the pollution parameters of the Gulf of İzmit, Çoban (6) has determined the BOD value following the industrial purification in the wastewater of the milk and milk product plants as 217 mg/l, the COD value as 448 mg/l, pH value as 6, the oil and grease value as 488.5 mg/l. In a study conducted on the effects of the waste water of the food industry in the Bursa region on

---

[*] This assay was summerized from PhD thesis

Table 1. The average, minimum and maximum values obtained from the analyses of the wastewater samples prior to treatment
Tablo 1. Arıtma öncesi atıksu örneklerine ait ortalama, minimum ve maksimum değerler

Parameter	Average			Minimum			Maximum		
	A	B	C	A	B	C	A	B	C
BOD (mg/l)	9451	4854	9787	6065	2140	7292	11736	5340	12843
COD (mg/l)	13299	12440	14394	11271	8627	11587	16270	18696	17463
TSS (mg/l)	2137	1804	2075	1170	1135	1030	3100	2628	3038
FOG (mg/l)	195	141	202	120	109	148	268	185	285
pH	5.7	4.2	5.7	5.5	3.8	5.1	6.0	4.5	6.5

Table 2. The average, minimum and maximum values obtained from the wastewater sample following the treatment
Tablo 2. Arıtma sonrası atıksu örneklerine ait ortalama, minimum ve maksimum değerler

Parameter	Average	Minimum	Maximum
BOD (mg/l)	32	21	51
COD (mg/l)	149	90	273
TSS (mg/l)	28	21	40
FOG (mg/l)	30	19	40
pH	8.4	8.2	8.6

the environmental pollution, the average COD value has been determined as 2172 mg/l, the COD value as 10362 mg/l, the oil and grease value as 735 mg/l (10). Günşen and Anar (9) have determined with the samples taken from 5 milk and milk product plants from among 26 food processing enterprises the average BOD value as 63685 mg/l, the average COD value as 80966 mg/l, the oil and grease value as 1500 mg/l and the value of the suspended solid matters as 4088 mg/l.

In a study conducted by Cayless et al. (5) pertaining to the wastewater of an ice-cream factory, the researchers have found out that the COD value was between 3420-9170 mg/l, the TSS value was between 550-1600 mg/l, the oil and grease value was between 241-1320 mg/l and the pH value was between 2.8-7.5.

Gough and McGrew (8) have recommended the aerobic microbiological treatment as the most suitable treatment method for the milk plant.

Though Fang (7) points out in a study conducted with the purpose to examine and determine which treatment, whether aerobic or anaerobic treatment, would be the correct method to be used for the wastewater of the milk industry that both systems can be used but it has been specified in that study that the active mud system could be preferred when compared to the aerobic treatment system by taking into account the short period and the high productivity of the active sludge system.

In a study, in which the active mud was examined, the COD value of the waste water prior to treatment from a cheese factory was determined as 1180 mg/l and as 570 mg/l for the wastewater discharged from the active sludge treatment system. The COD value of the wastewater of milk factory prior to treatment was determined in the same study as 2840 mg/l and as 1290 mg/l following the treatment (3).

Although the results obtained by the other researchers differ in some way from our results, basically they support our findings and a consensus will be reached on the aerobic microbiological treatment method. It is reckoned that the high values determined by some researchers are due to the structural differences of the enterprises and the production of different milk products.

It has been determined as the conclusion that the BOD, COD, TSS, oil and grease values in the wastewater of the milk industry prior to treatment are high. It has been observed on the other hand that the values determined in the wastewater samples obtained following the treatment have been reduced to comply with the legal limits. Based on these findings, we have come to the conclusion that the treatment of the wastewater of the milk industry is inevitable for the prevention of the increase of the loads, of which the source is the milk industry, for the protection of the environmental health and the preservation of the ecological balance. It has been determined that first the balancing pools, then chemical treatment, subsequently treatment with active mud method and conclusively the implementation of the ventilation pools and discharge would be appropriate.

References

1. **Anon** (1989a): *Standard Methods for the Examination of Water and Wastewater*. 17 th Ed., American Public Health Association (APHA), American Water Works Association (AWWA), Water Pollution Control Federation (WPCF), Washington D.C.

2. **Anon** (1989b): *Su Kalitesi, Toplam Askıda Katı Madde Tayini*., TS-7094/ Mayıs 1989.

3. **Anon** (2001): *BOD/COD removal using the electropure water treatment system.* Version1.1.,242 Canterbury Road Canterbury NSW, Australia.

4. **Bilgin SA** (1996): Adapazarı Katı Atıklarının Çevreye Etkisi ve Alternatif Sahaların Seçimi. Sakarya Üniversitesi

Fen Bilimleri Enstitüsü Çevre Mühendisliği Anabilim Dalı. Yüksek Lisans Tezi.

5. **Cayless SM, Marques DMLM, Lester JN (**1989**)**: *The effect of transient loading , pH and temperature shocks on anaerobic filters and fluidised beds.* Environ Technol Lett **10**, 951-968.

6. **Çoban R** (1997): İzmit Körfez Suyunun Kirlilik Parametreleri Üzerinde Fabrika Atık Sularının Rolü. Uludağ Üniversitesi Sağlık Bilimleri Enstitüsü, Besin Hijyeni ve Teknolojisi Anabilim Dalı.Yüksek Lisans Tezi.

7. **Fang HHP** (1991): *Treatment of wastewater from a whey processing plant using activated sludge and anaerobic processes.* J Dairy Sci, **74**, 2015-2019.

8. **Gough RH, Mcgrew P** (1993): *Preliminary treatment of dairy plant waste water.* J Environ Sci Health, A **28**, 1-19.

9. **Günşen U, Anar Ş** (2000): *Bursa'da faaliyet gösteren sanayi kuruluşlarının kirletici etkilerinin araştırılması.* Süleyman Demirel Üniv Tıp Fak Derg, **7**,43-51.

10. **Zeytinoğlu E** (1993): Bursa Bölgesi Gıda Sanayii Atıksularının Çevre Kirliliğine Etkileri. Uludağ Üniversitesi Sağlık Bilimleri Enstitüsü Besin Hijyeni ve Teknolojisi Anabilim Dalı.Yüksek Lisans Tezi.

Address for correspondance
Uzm. Dr. F.Seda Bilir Ormancı
Ankara University, Faculty of Veterinary Medicine,
Department of Food Hygiene and Technology,
06110 Dışkapı, Ankara, Turkey
Phone:0312 317 03 15 /223
e-mail: sbilir@veterinary.ankara.edu.tr