

BIOLOGICAL TREATMENT AND BEST MANAGEMENT PRACTICES ON FOOD INDUSTRY WASTEWATER IN ALBANIA

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Abstract: Food industrial wastewater are unique, not only in the production operations but also the sources of water they discharge. The processing food industries requires large quantities of potable water, and nearly all of this is discharged as high strength organic, nutrient (nitrogen and phosphorus), fat and microbial contaminated effluent.

Minimization of waste waters discharges consist on keeping in control the quantity and quality of waste waters produced at a dairy, meat and fish industry in terms of their loadings and also waste water treatment and disposal in an environmentally manner.

In this investigation thorough pretreatment studies were done using inorganic coagulant and activated sludge. The coagulant treatment was followed by activated charcoal treatment, in dairy wastewaters, and activated sludge treatment in meat and fish wastewater.

Food industries has to deal with a number of environmental challenges. This includes responsible wastewater treatment and disposal to prevent land and water pollution.

Key words: Dairy wastewater; Meat wastewater; Fish wastewater; Coagulants; Powdered activated charcoal (PAC); Activated sludge (AS); COD; BOD

Dairy, meat and fish processing wastewaters are discharged as high organic, nutrient, fat and microbial contaminated effluent which has caused an increase in the receiving water pollution.

The food industry has to deal with a number of environmental challenges. This includes responsible wastewater treatment and disposal to prevent land and water pollution. A well designed and managed wastewater treatment system is essential to achieve regulatory requirements and help protect and maintain a sustainable environment.

By focusing on reducing water usage, optimize wastewater treatment and improved waste management, both disposal and treatment costs can be reduced.

Best management practice involves:

- Treating wastewater to a standard required for the disposal route chosen;
- Minimizing wastewater generation;

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- Monitoring and reporting the treatment system performance;
- Increasing recycling or reuse to reduce the need for water usage and hence wastewater treatment where regulations and licenses permit.

In accordance with the emission standard, food industries should practice a protocol for processing and treatment of effluents that affect the overall plant economy.

The biological wastewater treatment reactors include aerobic and anaerobic reactors which are used for the dissolution of organic compounds.

Waters deriving from dairy, meat, fish industries are distinguished by high content of: BOD and COD, high levels of solids or suspended solids, grease, nutrients such as ammonia and phosphates. Food wastewaters were subjected of physical (filtration), chemical treatment with coagulant and biological treatment. Pre-treatment was done to reduce the suspended and colloidal masses by reducing the turbidity and organic matter responsible for high values of BOD and COD. Chemical treatment was done based on optimal quantities coagulant, pH and residence time.

The biological treatment was done using two types of activated sludge. The first was from the oxygenation taken and the second from the secondary decanter. The highest effectiveness we have obtained was from the oxygenation tank, so the values presented below are from this treatment. During the analyzes of the discharged waters were performed these measurements:

- pH
- COD
- BOD₅
- PO₄ (mg P-PO₄)
- NH₄ (mg N-NH₄)
- NO₃ (mg N-NO₃)
- N – total
- P – total
- SS

All the measurements were done before and after the treatment of the both samples, meat, fish and dairy. The results from the dairy industry are shown in the table below:

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<i>Parameters</i>	<i>SS</i> (mg/l)	<i>COD</i> (mg/l)	<i>BOD₅</i> (mg/l)	<i>P-Tot</i> (mg/l)	<i>N-Tot</i> (mg/l)
Case A before treatment	207.7	1500	620	2.35	0.035
Case A after treatment	45	172	67	0.36	0.028
Case B before treatment	205	1500	1500	1.01	0.43
Case B after treatment	36.7	168	120	0.73	0.03
Case C before treatment	2162	1500	1250	1.17	1.047
Case C after treatment	98.5	164	80	0.84	0.002
Case D before treatment	2522	6000	2500	28.6	1.853
Case D after treatment	83.1	256	115	13.4	0.001
Normal Value	50	250	50	2	10

Table 1: Results taken from the dairy industry

A graphical presentations of all parameters which has been monitored during study, are showed in the following figures 1-4.

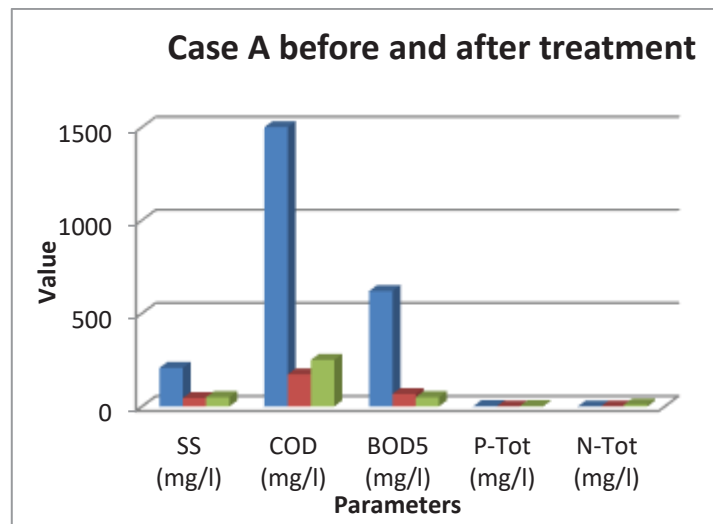


Figure 1: Results taken from case A in the dairy industry

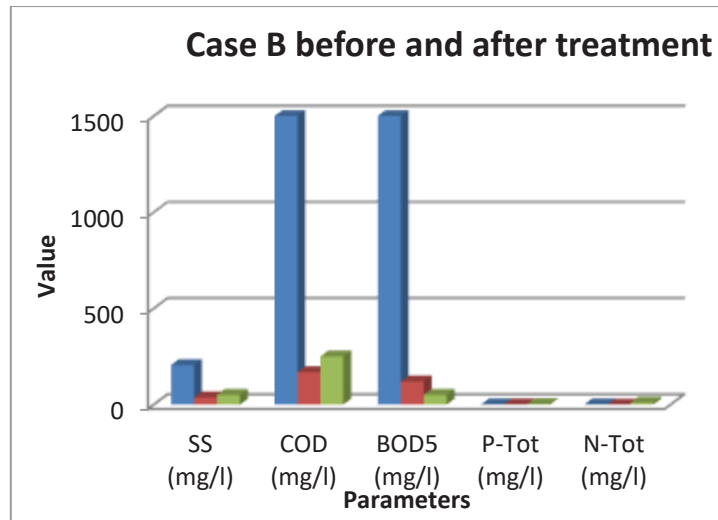


Figure 2: Results taken from case B in the dairy industry

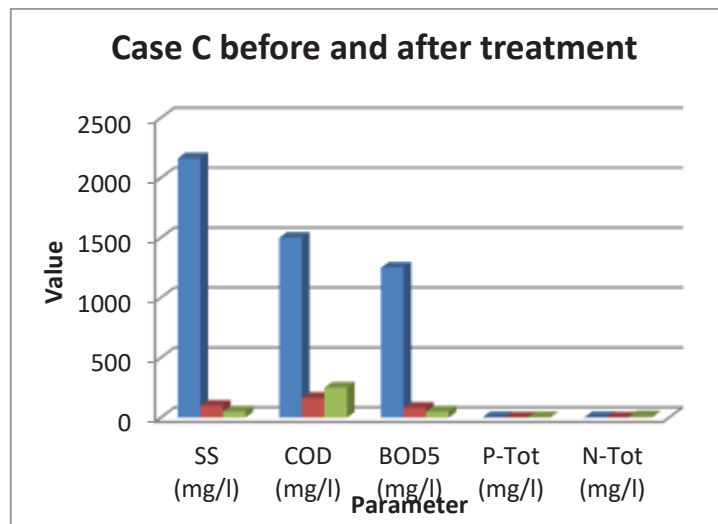


Figure 3: Results taken from case C in the dairy industry

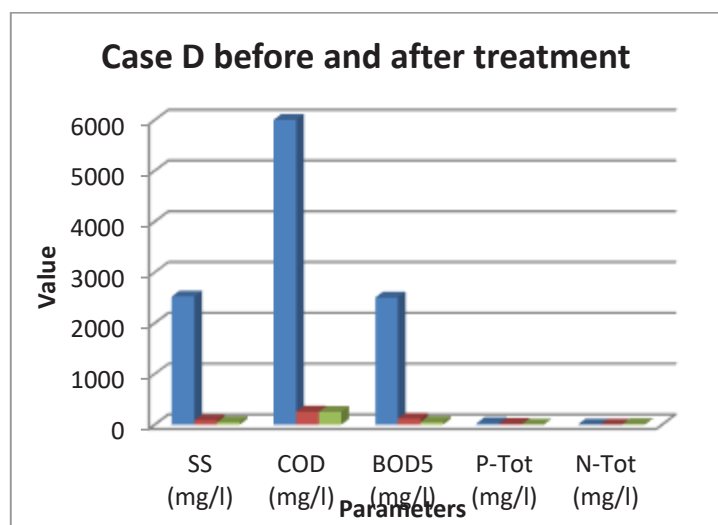


Figure 4: Results taken from case D in the dairy industry

The results from the meat and fish industry are shown in the tables below:

<i>Parameters</i>	<i>Value before treatment</i>	<i>Value after treatment</i>	<i>Normal values</i>
COD (mg O/l)	3928	328	250
BOD₅ (mg O/l)	2200	162	50
N-NO₂ (mg/l)	5.42	1.004	
N-NH₄ (mg/l)	30.1	2.03	
N-NO₃ (mg/l)	8.28	0.071	
P-PO₄ (mg/l)	34.8	3.76	
P-total (mg/l)	49.1	8.6	5
pH	7.25	7.53	6-9
SS (mg/l)	475	106	50

Table 2: Results taken from the meat industry

<i>Parameters</i>	<i>Value before treatment</i>	<i>Value after treatment</i>	<i>Normal values</i>
pH	7.3	7.1	6-9
COD (mg/l)	4400	194	250
BOD₅ (mg/l)	3900	67	50
P-Tot (mg/l)	43	6.8	5
N-Tot (mg/l)	390	11.3	10
SS (mg/l)	1044.6	75.5	50

Table 3: Results taken from the fish industry

The graphical presentations of all parameters which has been monitored are in the following figures 5 – 6.

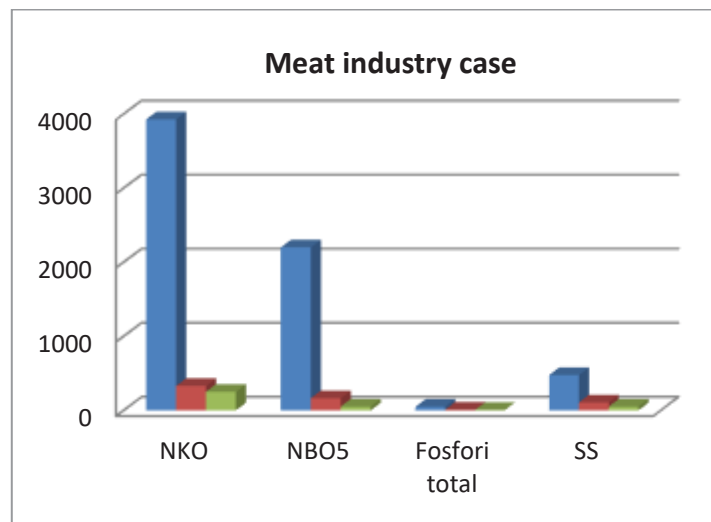


Figure 5: Results taken from meat case industry

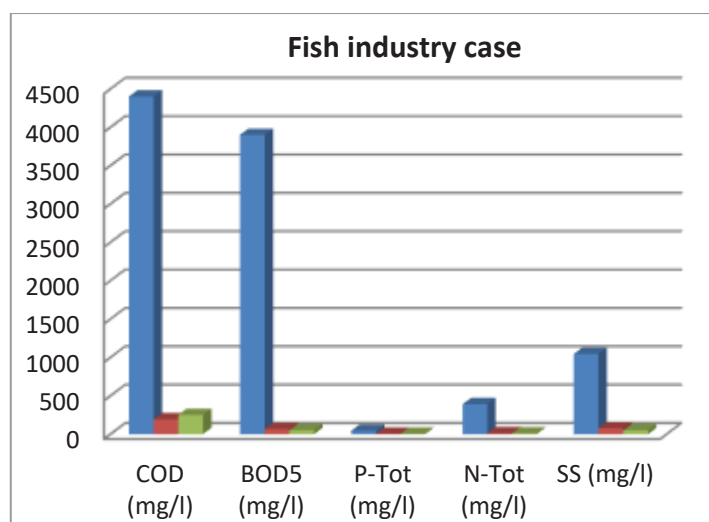


Figure 6: Results taken from fish case industry

From the analysis, the parameters of the discharge waters from the food processing industry are very high compared to the Albania norms legislation no.177.

The percentage of reduction of the parameters analyzed given below are very noticeable:

<i>Food Industry</i>	<i>% of COD reduction</i>	<i>% of BOD reduction</i>	<i>% of SS reduction</i>	<i>% of P-Tot reduction</i>	<i>% of N-Tot reduction</i>
Dairy A	88.5	89.2	78.3	84.7	25
Dairy B	88.8	92	82.1	27.7	93
Dairy C	89.1	93.6	95.4	28.2	99.8
Dairy D	96.7	95.4	96.7	53.1	99.9
Meat	91.6	92.6	77.8	82.5	---

We recommend food industries to implement as soon as possible wastewater treatment plants in their activities.

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