Assessment of Wastewater Quality From Dairy Industries in the Kingdom of Bahrain

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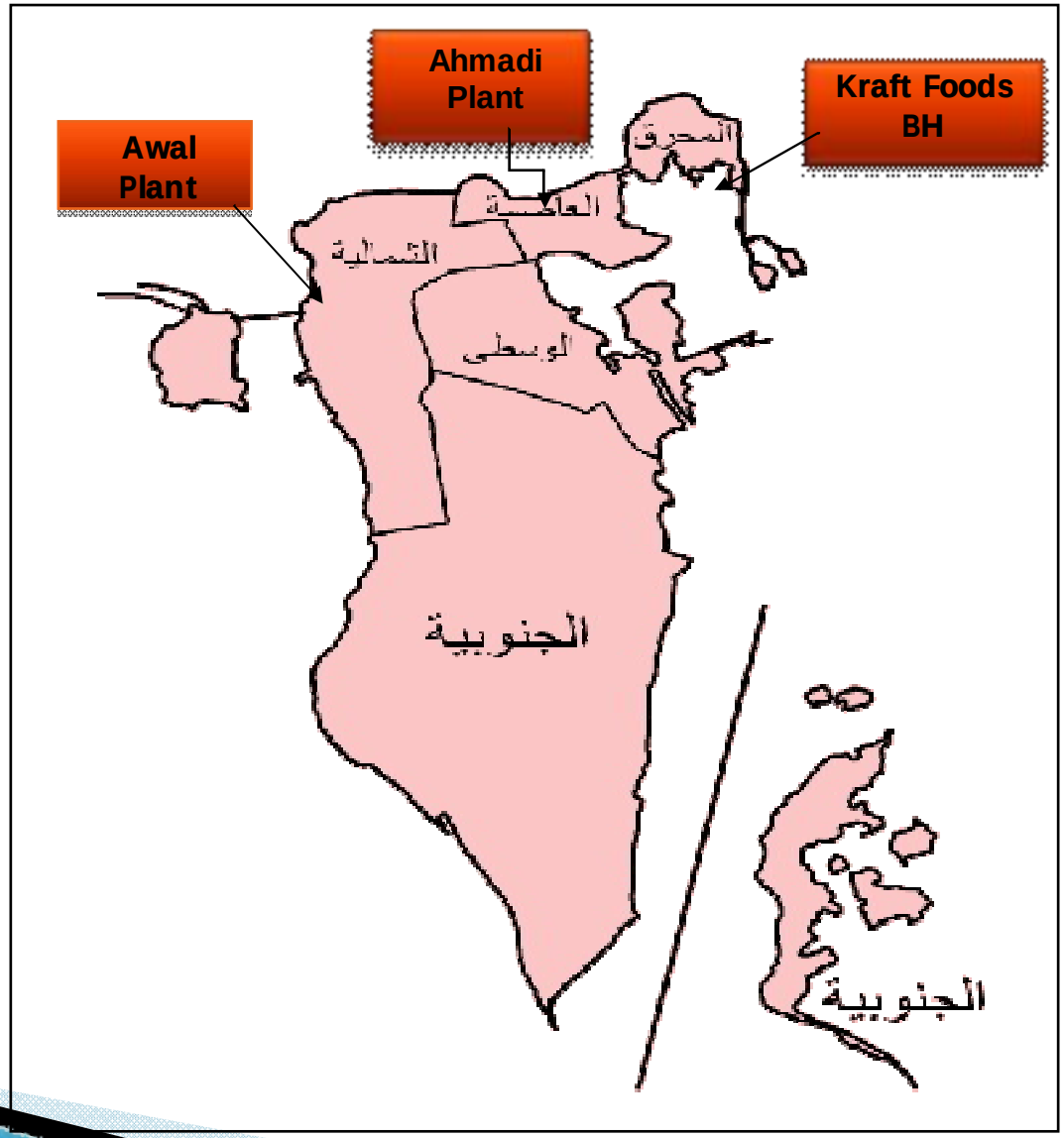
Introduction

- The dairy industries are important to many countries.
- Dairy products include milk, cheese, butter, yogurt and ice cream.
- The process of manufacture of milk include several stages
  - Receipt.
  - Storage.
  - Separation.
  - homogenization under high pressure to reduce the fat; and
  - heat treatment pasteurization.

- Wastewater from the dairy industry formed by:
  - o Mixing of cooling water
  - o Wash water tanks
  - o Waste resulting from manufacturing operations
  - o Steam Boilers
  - o Production areas
- The wastewater rate for the dairy sector has a high pollution of fat, grease and acids. Therefore, the wastewater is processed with different technologies to prevent or reduce environmental pollutants.

Locations of Dairy Plants



Methodology

Stages

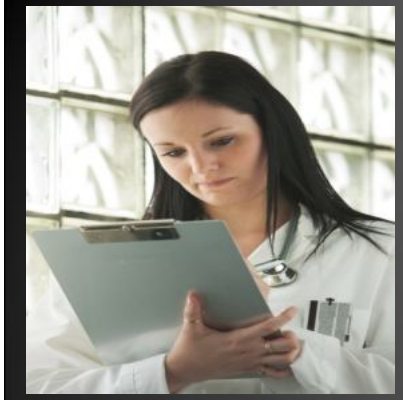
- Collect data & literature review
  - Site visit of dairy plants and collect sampling during 6 months (twice per m)
  - Specialist interview
- Field & practical study
  - Take sampling and analyze it
- Analytical and discussion results by Statistica-8
- Comparison of plants results & Environmental Mgt plan

Collect sampling

Quality Control & Calibration Methods

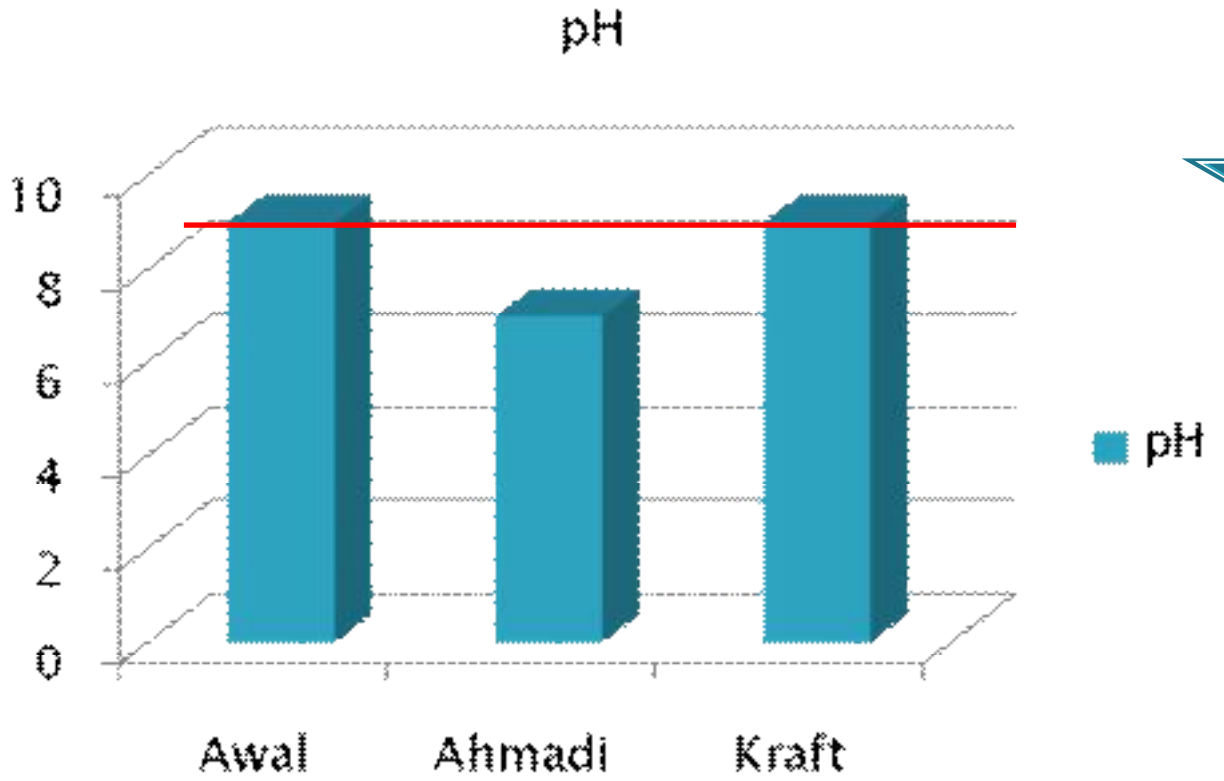
- The Quality control and calibration methods were performed by Tubli bay Laboratory.

Parameter	Calibration	Method
pH	Daily on time and if required	pH-meter
E. conductivity	Daily on time and, if required	E. conductivity-meter
TSS	NA	Filtration
VSS	NA	Filtration
NO_3	Daily on time and, if required	Titration
PO_4	Daily on time and, if required	Titration
FOG	Daily on time and, if required	Separation of solvents
COD	Daily on time and, if required	Titration
BOD	Daily on time and, if required	Titration
T.coliform	Daily on time and, if required	Media known positive and negative, and the temperature of the incubator (37)



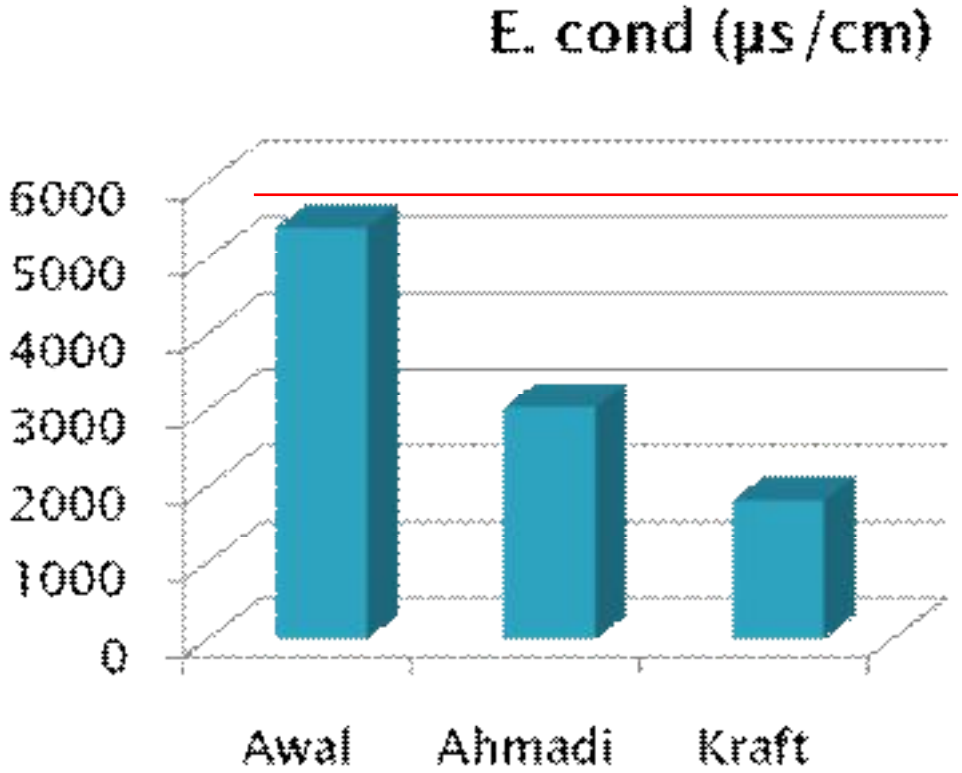
Results & Discussion

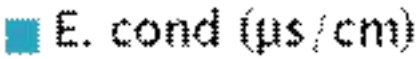
Results & Discussion



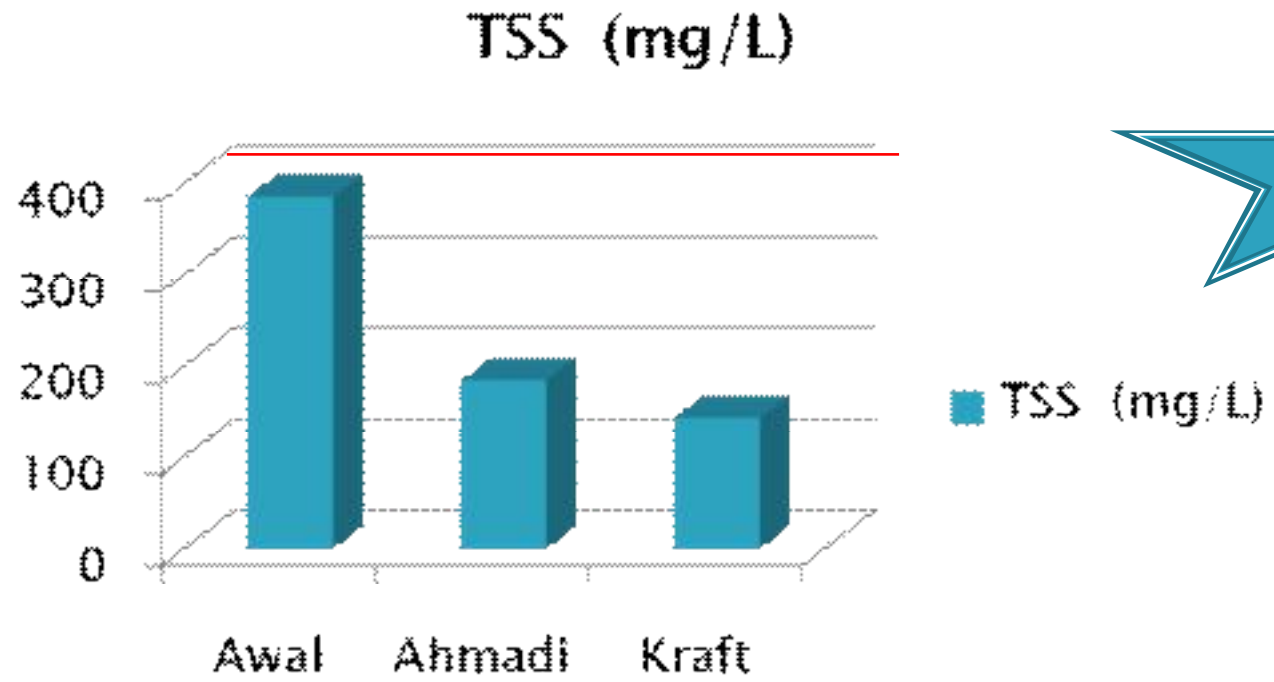
9

Kraft	Ahmadi	Awal	
9	12	12	Max limit
8	4	2	Min limit
9	7	9	Average
0.3	2	3	STD

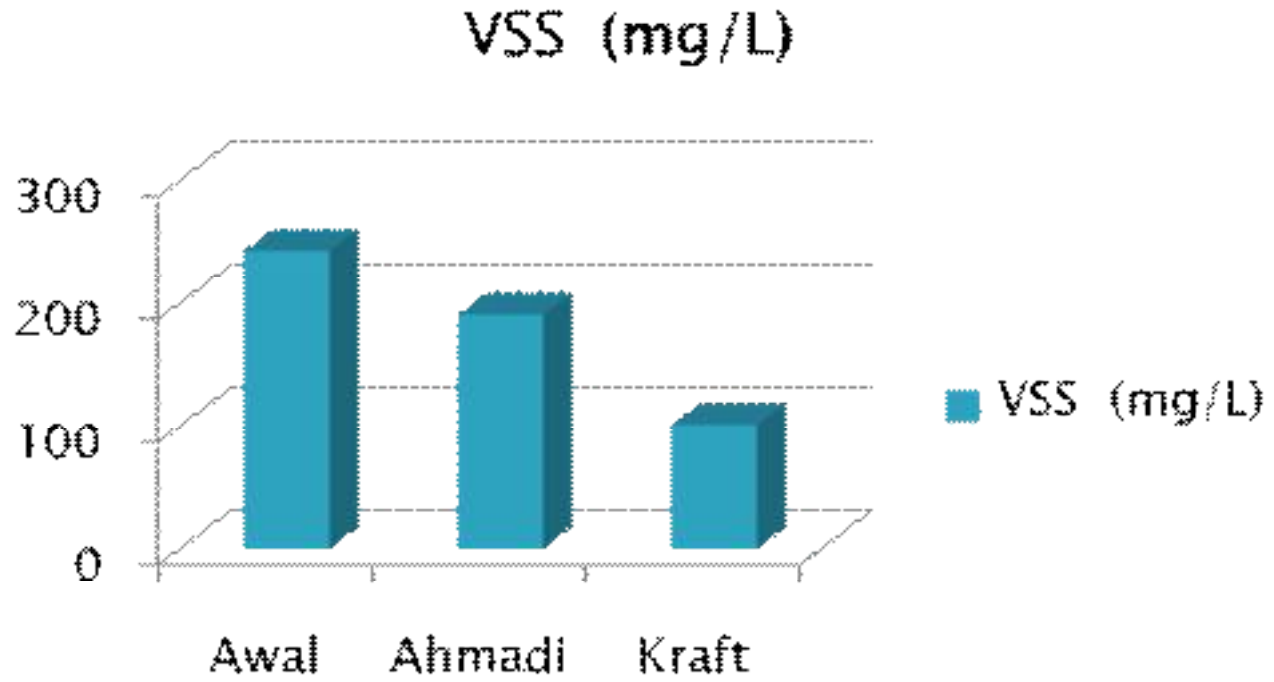




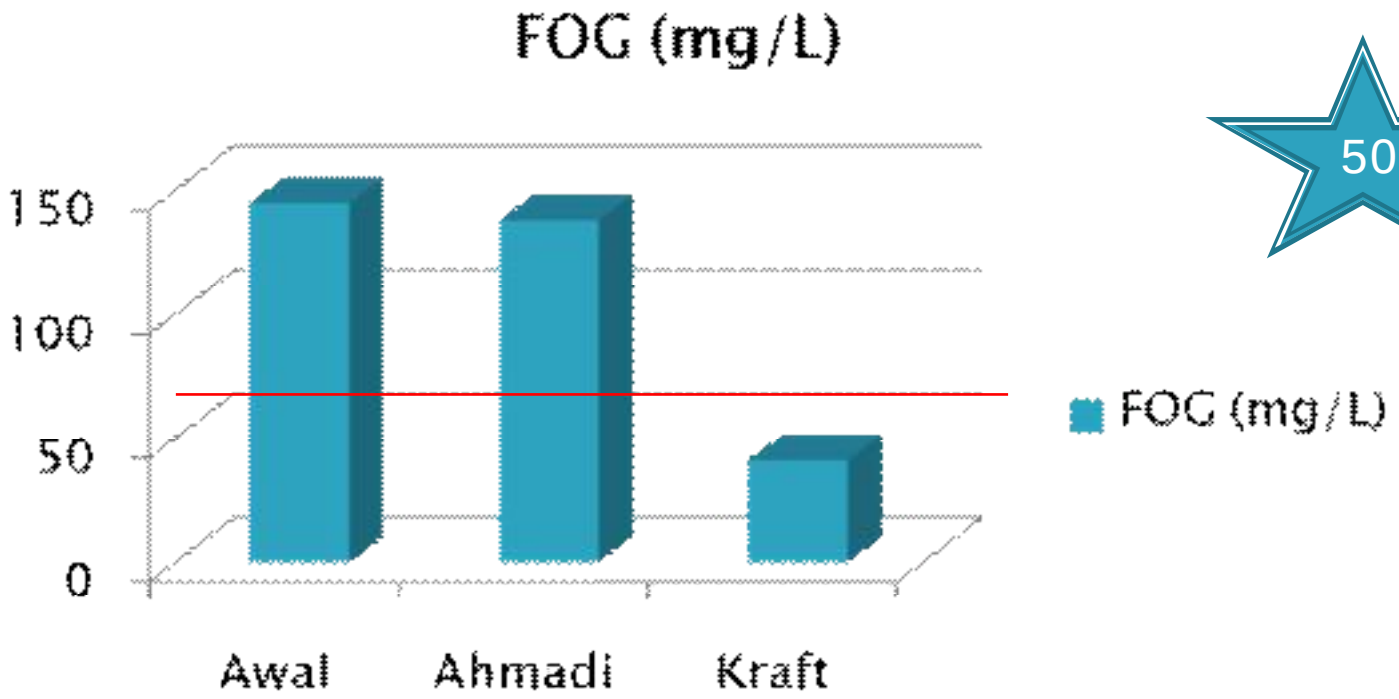
Kraft	Ahmadi	Awal	
2473	9950	884	Max limit
1146	525	25050	Min limit
1822	3040	5404	Average
445	3199	6982	STD



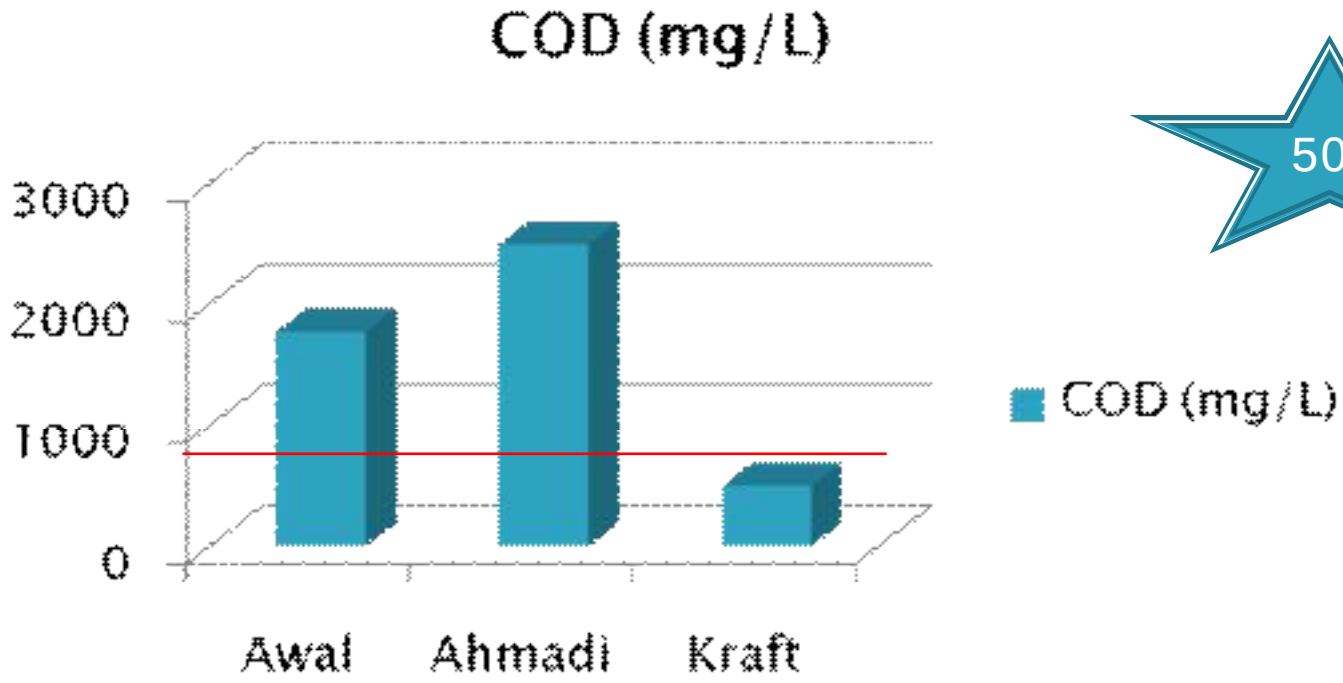
Kraft	Ahmadi	Awal	
360	948	1000	Max limit
8	4	42	Min limit
144	185	386	Average
110	260	301	STD



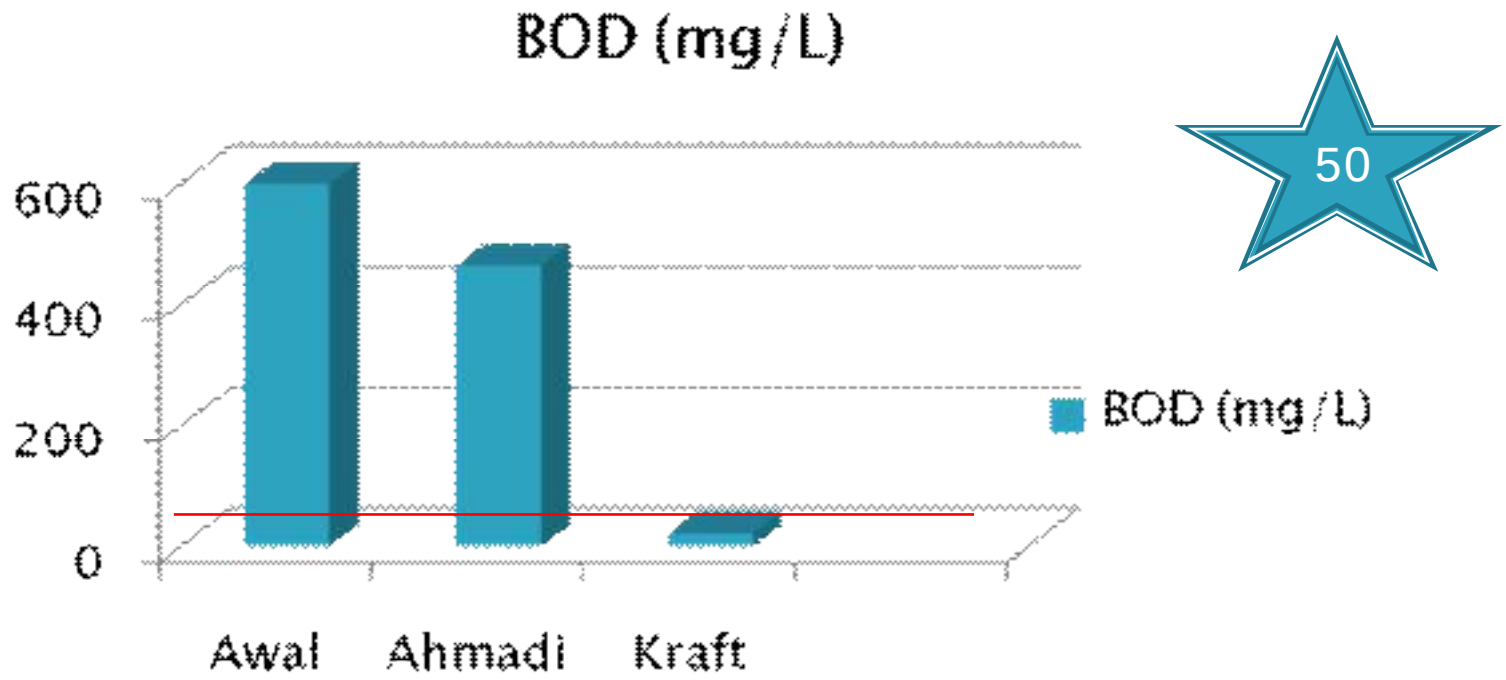
Kraft	Ahmadi	Awal	
382	944	582	Max limit
2	10	10	Min limit
101	190.9	243	Average
103	293	226	STD



Kraft	Ahmadi	Awal	
95	636	452	Max limit
3	17	32	Min limit
41	138	145	Average
34	170	130	STD

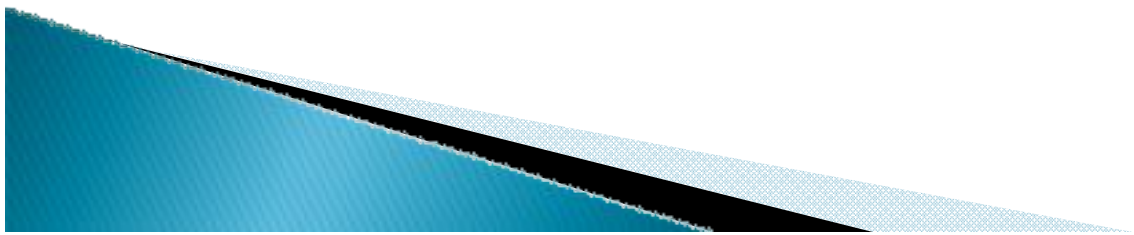


Kraft	Ahmadi	Awal	
4400	9959	4180	Max limit
44	175	22	Min limit
497	2501	1774	Average
1231	3610	1238	STD

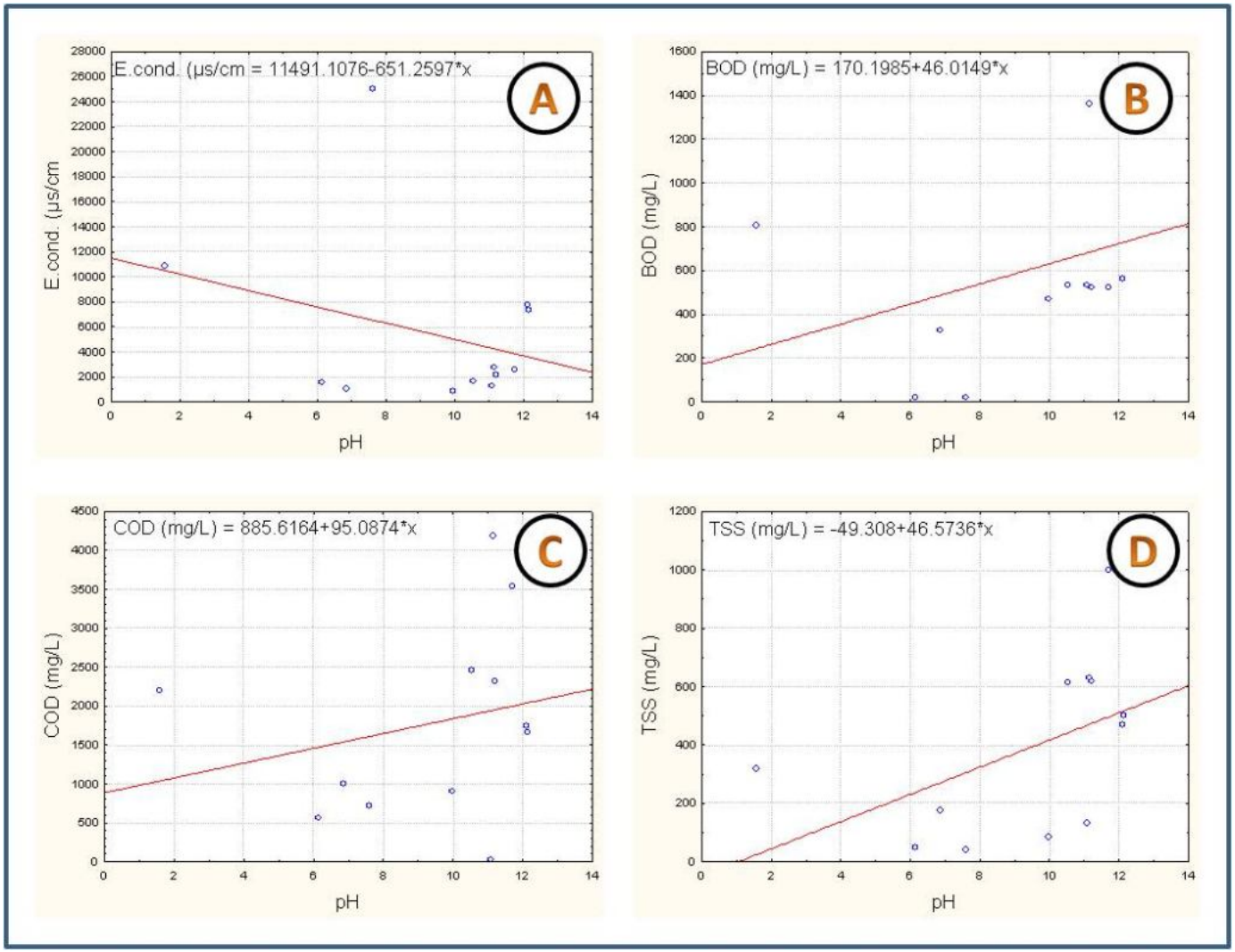


Kraft	Ahmadi	Awal	
39	2585	1528	Max limit
0.01	19	21	Min limit
21	466	600	Average
12	728	454	STD

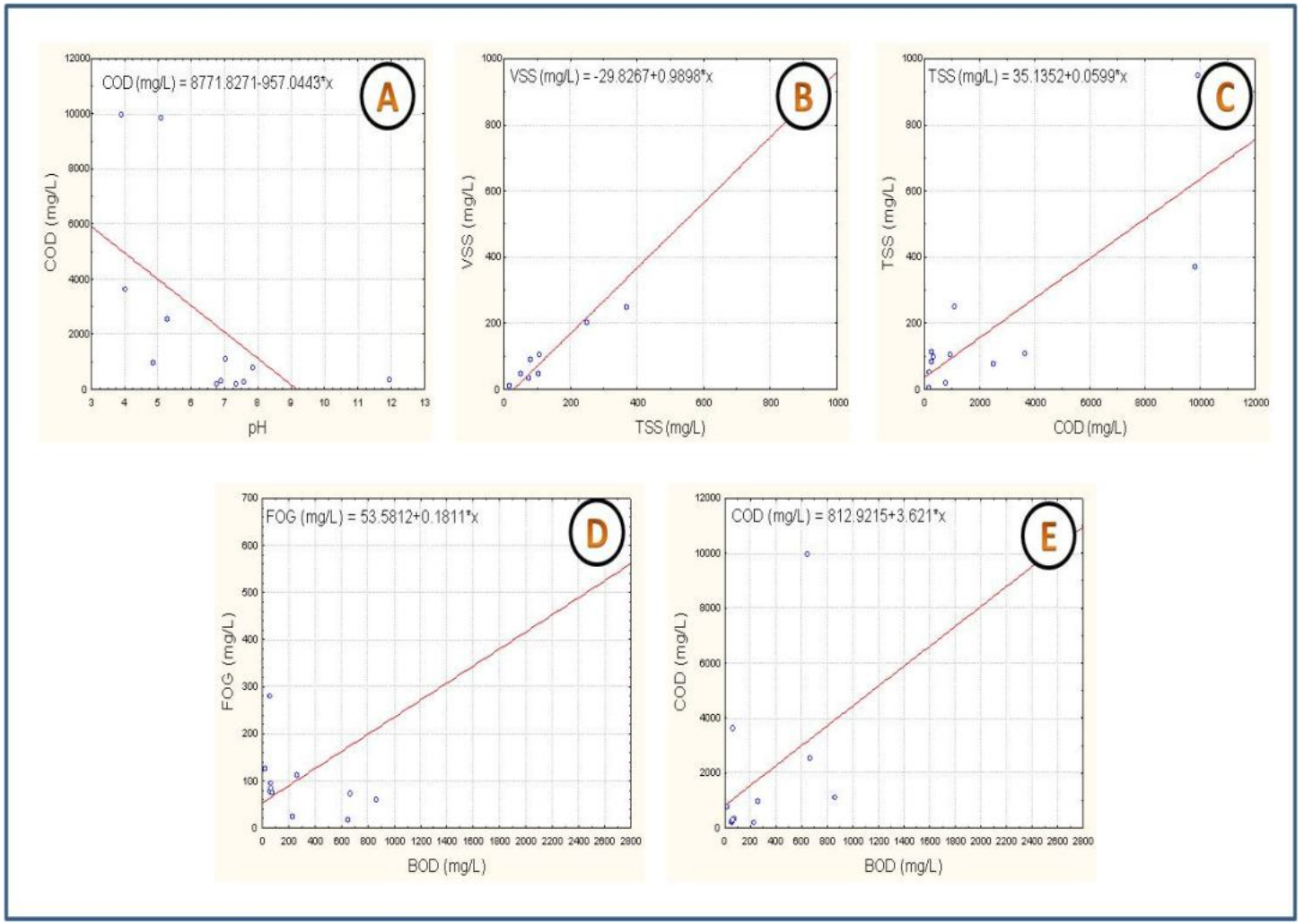
The Relations Between Different Elements



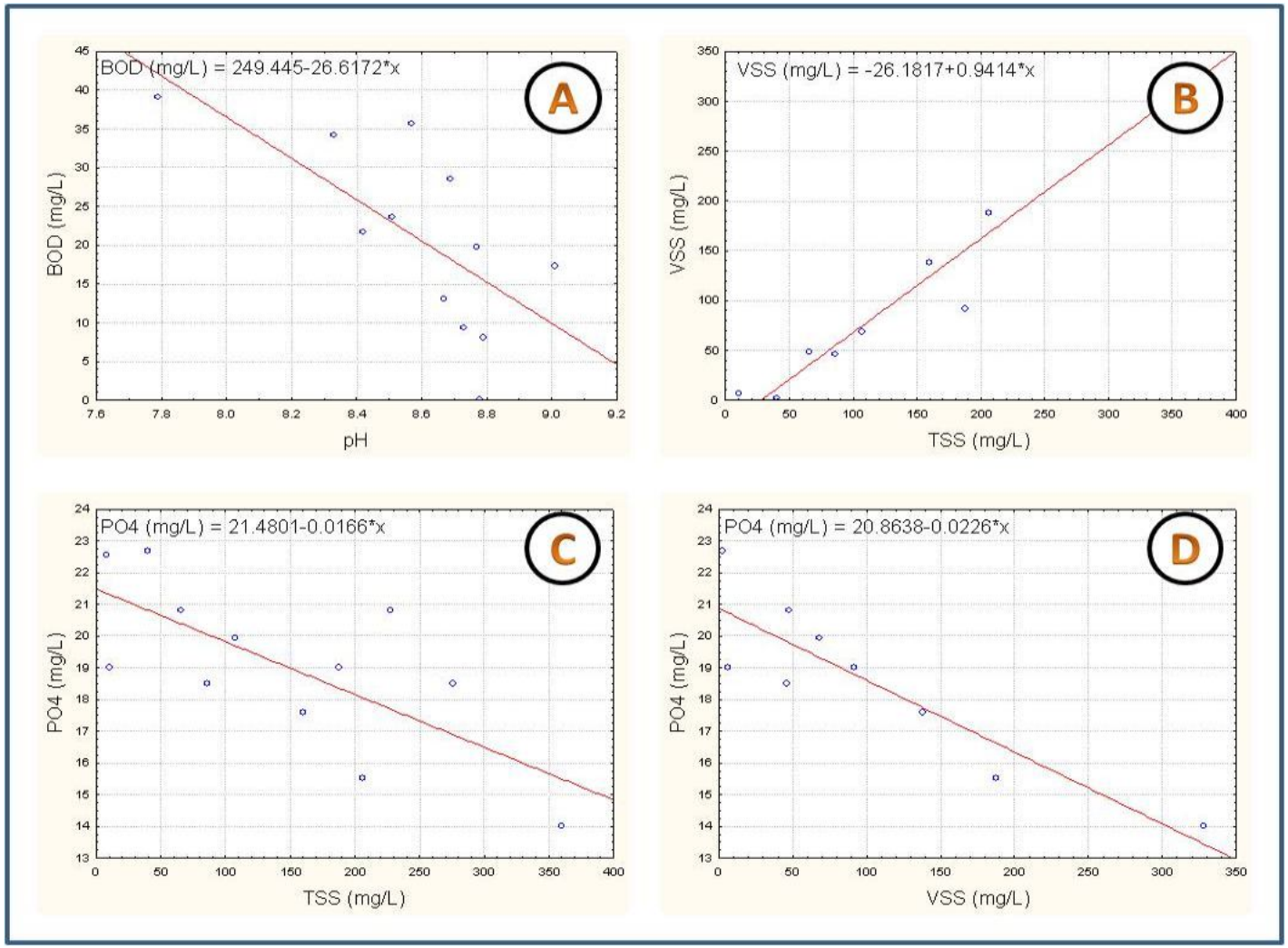
Awal


E.cond. (µs/cm = 11491.1076-651.2597*x
A
E.cond. (µs/cm
pH
BOD (mg/L) = 170.1985+46.0149*x
B
BOD (mg/L)
pH
COD (mg/L) = 885.6164+95.0874*x
C
COD (mg/L)
pH
TSS (mg/L) = -49.308+46.5736*x
D
TSS (mg/L)
pH

Ahmadi

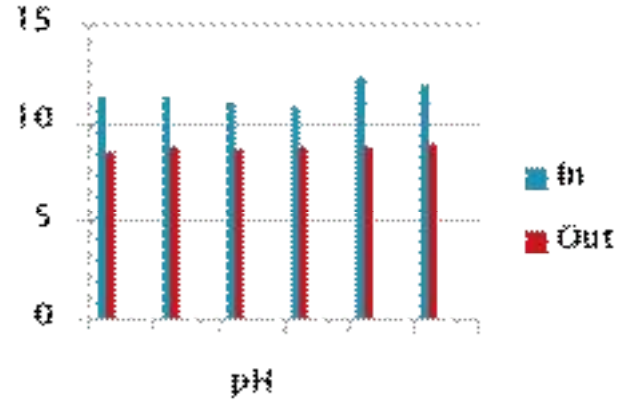

COD (mg/L) = 8771.8271-957.0443*x
A
COD (mg/L)
pH
VSS (mg/L) = -29.8267+0.9898*x
B
VSS (mg/L)
TSS (mg/L)
TSS (mg/L) = 35.1352+0.0599*x
C
TSS (mg/L)
COD (mg/L)
FOG (mg/L) = 53.5812+0.1811*x
D
FOG (mg/L)
BOD (mg/L)
COD (mg/L) = 812.9215+3.621*x
E
COD (mg/L)
BOD (mg/L)

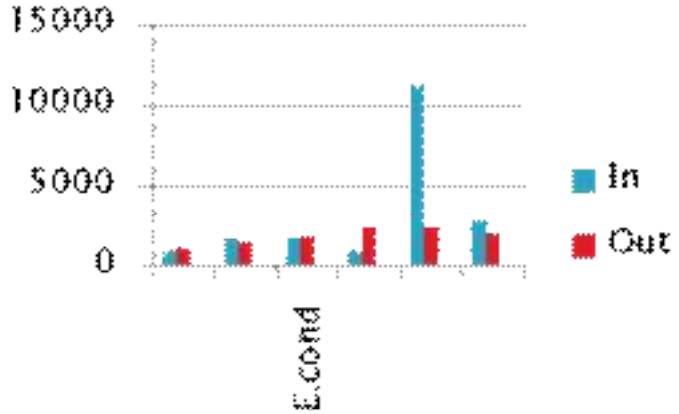
Kraft

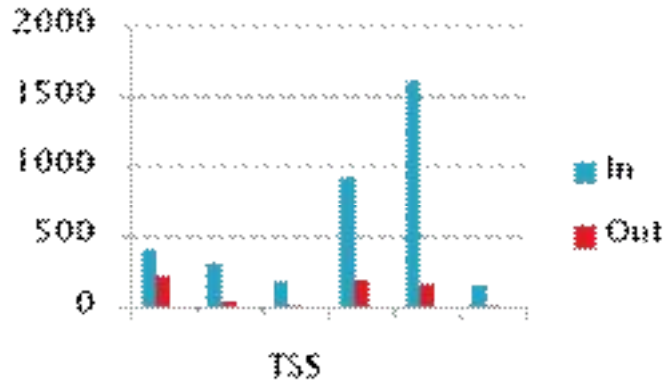

BOD (mg/L) = 249.445-26.6172*x
A
BOD (mg/L)
pH
VSS (mg/L) = -26.1817+0.9414*x
B
VSS (mg/L)
TSS (mg/L)
PO4 (mg/L) = 21.4801-0.0166*x
C
PO4 (mg/L)
TSS (mg/L)
PO4 (mg/L) = 20.8638-0.0226*x
D
PO4 (mg/L)
VSS (mg/L)

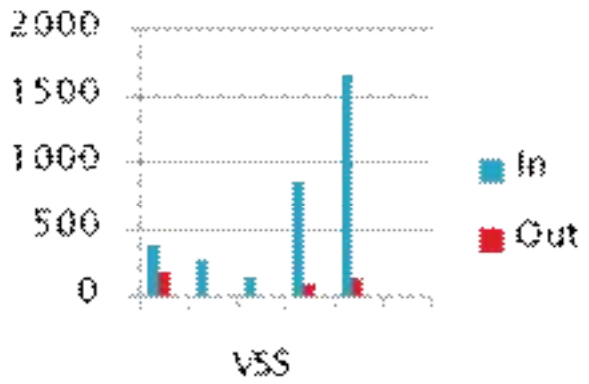
The Comparison Between Before & After Treatment For Kraft Plant

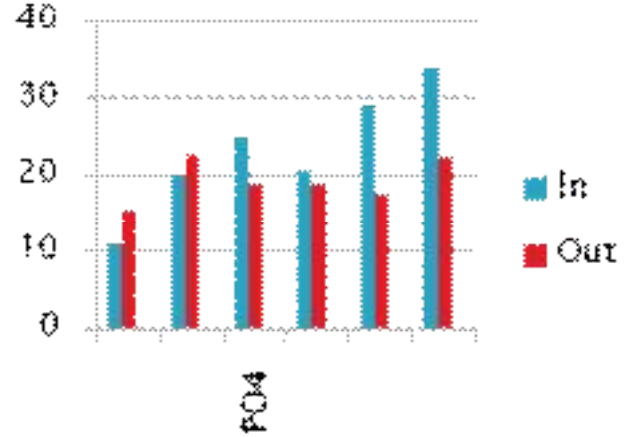
In & Out Results of Kraft Plant From May-October 2009

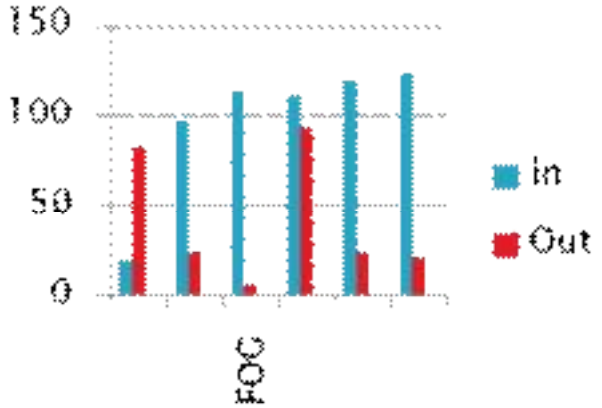


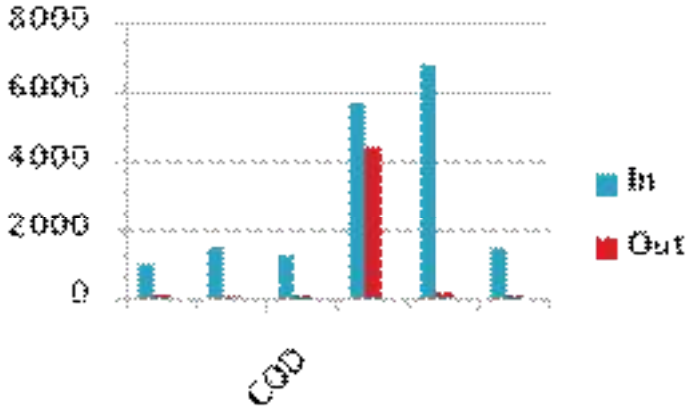


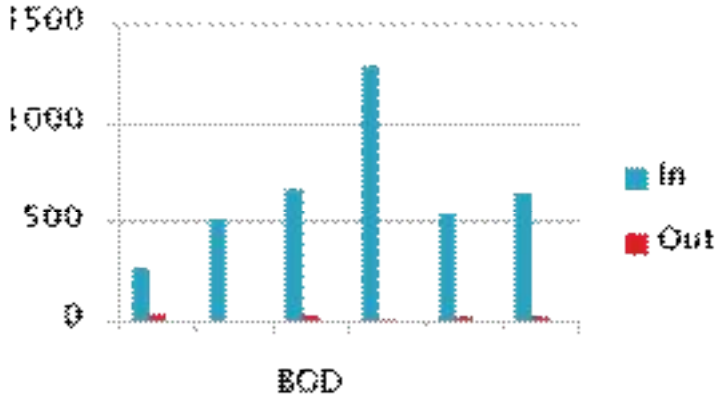





40
30
20
10
0
In
Out
PO4


150
100
50
0
In
Out
TOC


8000
6000
4000
2000
0
In
Out
COD


1500
1000
500
0
In
Out
BOD

Environmental Management Plan

Environmental Management Plan

Stage	Area	Responsible	Action Plan
Receipt and storage of milk	Storage Area	Receipt department of milk in the plant	Must be receipt in specific area. Must take into account health and safety. Must reduce the spill during delivery.
Pasteurization	Production Department	Operating Technician	Reduce energy consumption and water by reusing water. Reduce air emissions from the combustion gases and dust, and milk coolers through the use of filters
Milk products	Production Department	Workers in the production department	Reduce spill water during the manufacture of milk Choose a product design, material that could be recycled. Reduce the materials used in the production of milking. Resource assessment. Reduce the emissions of chemical in the water flowing. Reduce the use of chemicals in cleaning and washing tanks. Taken not to spill oil while maintaining production machine.
Cooling storage	Cooling Area	Cooling section	Must monitor the temperature of the cooling section on an ongoing basis.
Packaging and distribution	Packaging Area and Markets	Production and sales	Taking into account the temperature of the vehicles transporting products by product type . Use packaging materials as possible re-use them again. Recycling exhaust resulting from the packaging. Recycling of products damaged and expired in the manufacture of other products.
Wastewater	Production Department	Maintenance	Reuse water in irrigation of green area.

Conclusion

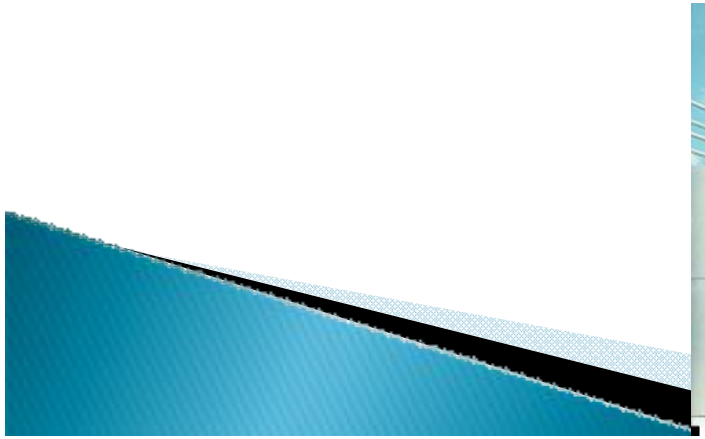
- We can control the quantity and quality of water, sanitation and selecting the raw materials and manufacturing methods.
- There are no specific relationships between environmental transactions in dairy plants.
- Total solids is indicate to the presence of volatile solids.
- Kraft has integrated laboratory to analyzes pollutants concentrations of treated wastewater.

Recommendation

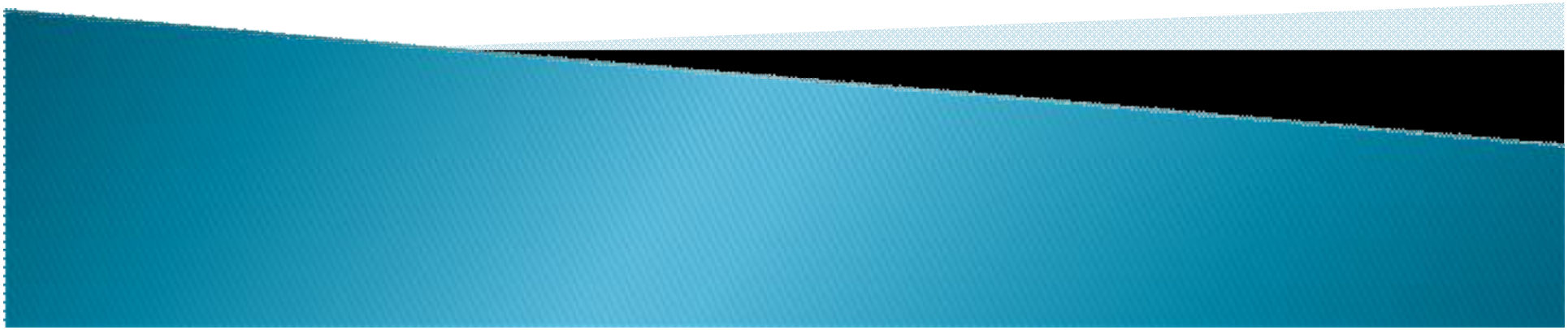
- Commitment to local environmental standard of wastewater for dairy plants.
- Support the local manufacturing of equipment that protects the internal and external environment of water pollution filters and components necessary to create a wastewater treatment industry.
- Development of economic incentives for the plants are committed to environmental requirements such as tax relief for imports.
- Set fines for the factories of others committed to the specifications allowed for water drainage.
- Prepare a plan of production for final disposal and safe, which can achieve and help to reduce the level of contamination.
- Maintenance technicians should be monitored during maintenance machines run the dairy to prevent oil loss which leads to the disbursement of sewage.

Cont:

- Develop a plan to monitor the operation and maintenance technicians to control not leak any of the remnants of production to wastewater.
- Establish treatment plants for wastewater before being discharged as the case in the Kraft plant.
- The establishment of an integrated laboratory for the work of laboratory analysis of wastewater treatment plants in the Effluent Treatment Plant (ETP).
- Should benefit from the treatment systems for dairy factories in the countries of the world.
- The possibility of recycling waste water processor in the plant.



Thank You For Your Attention



Questions?