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Research Article

## THE POLLUTION OF THE SEA WATER CAUSED BY THE REFINERY OF ANNABA AND WAYS TO REDUCE IT

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### Abstract

Very high polluting load of the sea is caused by waste water of the various shops of refinery vegetal oil located at annaba (Algeria). Experiments of de-oiling followed by coagulation flocculation showed that this method makes it possible to reduce most of the fat content 79%, 29% DCO and 15% of suspended matter.

**Keywords:** Pollution, water, greasy substance, water treatment.

### Footnote

**Résumé:** L'analyse des eaux rejetées des différents ateliers de la raffinerie d'huile végétale située à ANNABA (ALGERIE) à permis de constater une charge polluante très élevée à la mer. Des expériences de déshuilage suivi d'une coagulation floculation ont montré que cette méthode permet de réduire une grande partie des matières grasses 79% , 29% DCO et 15% de matière en suspension .

**Mots clés:** Pollution, eau, huile, corps gras, traitement des eaux.

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## I. INTRODUCTION

Coastal water is subjected permanently to urban environment, agricultural or industrial wastes. In this work we are interested particularly in pollution of a strongly polluted part of the ANNABA coast by the rejection of the fats by industry..

The manufacturing unit of company UP<sub>7</sub> situated at the port of ANNABA treats about 100 tons per month of colza and sunflower oil. This imported crude oil contains impurities which differ according to their organic character (wax, fatty acids, lipids, etc...). The unpleasant odour and color, caused by deposits during storage are harmful to human being.

The elimination of such impurities is carried out using acid and alkaline successive treatment oil followed by its

discolouration and deodorization. The various reagents ( sulphuric acid, alkaline, bleaching agent) and dissolved substances in the water in the city water and the sea water take part in the technological process during treatment of crude oil. Following such treatment it forms new products (salts, organics acids, soaps etc...) presenting the scraps, part of the latter (for example paste of the stage of neutralization) is recovered after the treatment corresponding and is used then for the other goals of the production. Another part is eliminated from the technological process in form of polluted liquid, the latter with worm water of the various operations forms waste water of this company.

In sea water of the ANNABA bay, the process of organic oxidation of the components of waste being carried out

in sea water reduces oxygen level for the development of the sea organizations. Significant flows are used by the unit 1070 m<sup>3</sup>/j water supply of city 40 m<sup>3</sup>/j in closed loop for the power supply of the boilers and 1100 m<sup>3</sup>/j of sea water for the cooling of the installations.

All the rejections are currently poured without any preliminary treatment The objective of this work is to estimate the polluting load of waste water with greasy substances from industry. It consists of analyzing water samples on the level of the refining workshops, of soap factory and on the outlet side of the central

collector for treatment tests and possibilities of reduction.

## II. ANALYZES PRINCIPALS WATER OF THE REFINERY

The waste water coming from the workshops of refining, soap factory, glycerin and boiler room is collected in secondary collectors then are forwarded to the central collector which discharges directly into the sea (figure 1).

Only oil and soapy water fat content and matters considered during our work.

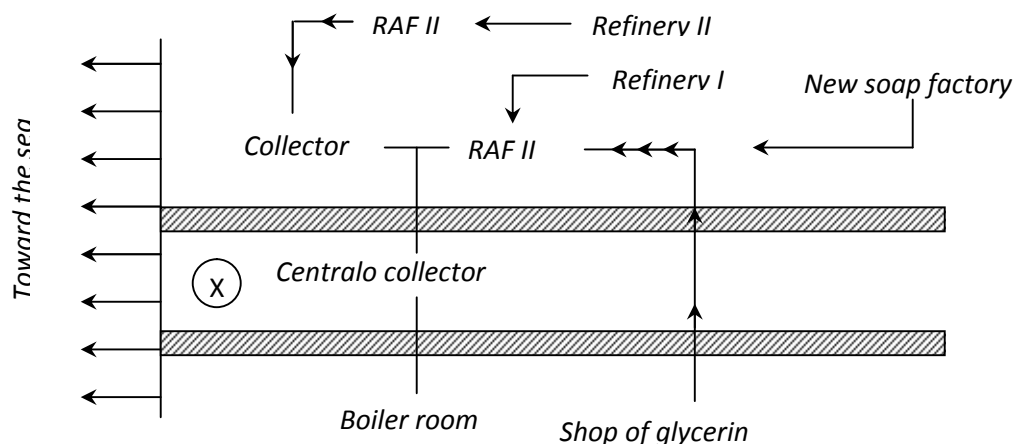


Figure 1. Diagram of collection of the residuary water to UP<sub>7</sub>

## III. EQUIPMENT NECESSARY FOR THIS WORK IS AS FOLLOWS :

<ul style="list-style-type: none"> <li>• pH measures,</li> <li>• Drying oven,</li> <li>• Analytical balances,</li> </ul>	<ul style="list-style-type: none"> <li>• A DCO measures,</li> <li>• One DBO measures,</li> <li>• A spectrophotometer.</li> </ul>
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Concerning the reagents we used :

<ul style="list-style-type: none"> <li>• The sulphuric acid (97 %),</li> <li>• Hydrochloric acid (37 %),</li> <li>• The nitric acid,</li> <li>• Alumina the sulphate,</li> </ul>	<ul style="list-style-type: none"> <li>• Potassium the chromate,</li> <li>• The ferric chloride the additive of flocculation ASP<sub>6</sub></li> <li>• And the ammonium crimson and molybdate.</li> </ul>
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The physico-chemical parameters measured are :

- Temperature,
- The PH,
- The rate of suspended matter,

- The fat content,
- The biochemical demand for oxygen measured with five day,
- The chemical request oxygenates some and the chloride and phosphorus level.

Four series of taking away were carried out a 8 hours for each one of its indicators, which supposes the comparable flows of rejection and the nonsingular values of concentration in the collectors.

**IV. POLLUTING LOAD ESTIMATION :**

Sampling was carried out at the exit of the workshops of refining soap factory, and of the collector central (table 1, 2 ,3). These measured parameters informs us about generally high levels of pollution in comparison with the standards (official journal 1993).

The pH and the temperature were the only parameters whose measurement led to acceptable values comparison with the standards .The PH was between 5,6 and 8,6 the temperature 29 °C. The MES are in significant concentration in the workshop of the soap factory which uses fatty acids minimal equivalent 3500 mg/l in the central collector represents a daily rejection of 6,8 tons. A flow of 2000 m<sup>3</sup>/j. The turbidity of water does not give access of the light and of oxygen trough the surface bayers of waters and is opposed to natural degradation some compounds. The M.G present in strong concentrations at the level of the refining workshop is due to the pastes for neutralization of acid oil. The presence of chlorides is explained by the use of the neutralizing pastes in the form of caustic soda, which reacts with oils releases chlorides.

The concentration out of DBO, DCO and phosphates in the central collector is lower than the concentration measured on the level of the refining workshop the soap factory. On the basis of these re it is possible to deduce a threat to for fauna Flora.

**V. TEST OF APPLICATION OF COAGULATION AND FLOTATION A THE PURIFICATION OF SEA WATER.**

The option for eliminating organic impurities from aqueous mediums are varied (1-5) and each option has both advantages asand disadvantages. We studied a in the laboratory the possibilities of application de-oiling followed by a coagulation-flocculation. B using two reagents [FeCl<sub>3</sub>/AS P<sub>6</sub>] and it [Al<sub>2</sub>(So<sub>4</sub>)<sub>3</sub>/ASP<sub>6</sub>].The comparison of the values of MG, MES, DCO, highlights a significant reduction the in content of organic substance (table 4).

In the same way a significant abatement of MG and DCO are also to announce after coagulation-flocculation of raw waters de-oiled (table 5) only them MES remain in relatively high proportion with an output of 15 % what is explained by the inadequacy of such treatment, a filtration would appropriate better for the treatment as of MES of this water.

The test of reduction of the DBO5 by a possible biological treatment was not tried.

Parameter	Unit	Taking away 05/ 05 /05 at 8h	Taking away 19/ 05 /05 at 8h	Taking away 26/ 05/05 at 8 h
T	°C	29	30	31
pH	-	7.6	6.6	7.2
MES	mg/l	3978	4000	6000
MG	mg/l	1307	9060	4630
DBO <sub>5</sub>	mg/l	1120	903,64	1410
DCO	mg/l	34,000	6000	16500
Chloride	mg/l	11,004	15974	16967
Phosphate	mg/l	132	104	109

**Table 1.** resulted from the analyses on the level of the workshop of rafining of the UP<sub>7</sub>.

Parameter	unit	Take away 05/ 05/05 at 8 h	Take away 19 / 05 /05 at 8h	Take away 26 /05/ 05 at 8 h
T	°C	19	24	21
PH		7,8	9,2	10,3
MES	mg/l	3950.5	3678	34510
MG	mg/l	2600	1030	710
DBO <sub>5</sub>	mg/l	53	69,63	367,4
DCO	mg/l	1000	1100	4540
Chlorides	mg/l	23420	20037	24990
Phosphates	mg/l	29	38	21

**Table 2 :** results of the analyses on the level of the workshop of soap factory

Parameter	unit	take away 05 /05/05 at 8h	Take away 19 /05/05 at 8h	Take away 26 /05/ 05 at 8h
T	°C	22	20	24
PH		8,3	8,1	8,5
MES	Mg/l	3784	3473	39269
MG	Mg/l	4300	3100	900
DBO5	Mg/l	251	400	700
DCO	Mg/l	6249	4500	17500
Chlorides	Mg/e	21200	20580	23927
Phosphates	Mg/e	39	27	31

**Table 3:** Results of the analyses at the central collecting level

Parameter	raw water	water de-oils	Water de-oils coagulated-flocculated (FeCl <sub>3</sub> /ASP <sub>6</sub> )	Water de-oils coagulated-flocculated (Al <sub>2</sub> (So <sub>4</sub> ) <sub>3</sub> / ASP <sub>6</sub> )
PH	8,4	2,1	6,6	6,4
MES mg/l	110	93,6	79	90,1
MG mg/l	1128,2	284,3	183	63,1
DOC mg/l	3400	2100	2000	1400

**Table 4.** Results of the analyses after treatment the laboraty

Parameter	water de-oils coagulated-flocculated (FeCl <sub>3</sub> /ASP <sub>6</sub> )	water de-oils coagulated-flocculated (Al <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub> / ASP <sub>6</sub> )
Suspended matter	0,26	0,16
Fat content	0,82	0,94
Chemical demand for oxygen	0,40	0,55

**Table 5.** Output of the coagulation–flocculation treatment

## VI. CONCLUSION

This study made it possible to highlight the high level of the rejections at sea and this in a new economic context characterized by competitiveness of the companies and where the environmental question cannot be relegated in to priority. The analytical results made it possible to propose a series of measurements whose realization would allow the reduction of this polluting load. The tests of decontamination partial of water followed de-oiling of a coagulation-flocculation shows that one can easily decrease a great part of the fat content 79%, 29% of the chemical demand for oxygen and 15% of suspended matter. This work can constitute a projection for the realization of an effective system of treatment in the companies of greasy substance Algerian.

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