"HENRI COANDA"
AIR FORCE ACADEMY
ROMANIA

"GENERAL M.R. STEFANIK"
ARMED FORCES ACADEMY
SLOVAK REPUBLIC

INTERNATIONAL CONFERENCE of SCIENTIFIC PAPER
AFASES 2012
Brasov, 24-26 May 2012

A STUDY OF BIOLOGICAL DECONTAMINATION OF FUEL AVIATION FIGHTING

Timur CHIS
Ovidius University Constanta

ABSTRACT: *Storage of petroleum products and bring changes to their quality and quantity. Especially in jet fuel, its storage resulted in loss of fuel quality due to microorganisms. Although chemists and biologists confirmed by theoretical studies that the presence of heavy metals (particularly lead) and low wax content and high arenas may destroy microorganisms. But microorganisms can develop their abilities to degrade hydrocarbons, or structural advantages are the extremely simple cell, which can adapt to critical situations.Also available organic substances in oil and food provide the energy source for some microorganisms.*
They degrade oil and jet fuel especially these inconveniences may occur:
a. Blocking filters,
b. Pipes blocking,
c. Errors of measurement devices for fuel
d. Corrosion acceleration due to sedimentation of water,
e. Damage to fuel quality (density, turbidity, octane modify).
To eliminate these possibilities should be sterile conditions for storage of fuel, this is impossible,
To ensure the elimination of this drawback, this material is to present the results obtained by the author on aviation fuel samples treated with micro molds) and were decontaminated with organic acids.

KEYWORDS*: OIL, KEROSEN, WATER EFECTS, COROSION.*

1. INTRODUCTION

During the storing of petroleum products to solve a problem is a loss of quality due to their cuataminations. In specialized studies [D. Popescu, 2004] this idea has appeared in small amounts and arenas in large amounts inhibits the development of micro-organisms. Also it was considered as heavy metals existing in the structure of hydrocarbons (lead, etc) and the solvents growth of resistant organisms slows down in oil. Through the study of water from petroleum products storage [T. Chis, 2012] it was established that some micro-oganismes they develop the ability to degrade hydrocarbons forming stages that metabolize bioconoses substrates organic.

Organic substances present in hydrocarbons in a variety of chemical structures provide a supportive environment for the development of microbial cultures in appropriate conditions of temperature, pressure and humidity the outer.

Starting from the idea that biodegradation is an attribute of organic substances by ensuring the circulation of chemical substances in nature, this property has on petroleum products and in particular on the negative effect of aviation kerosene by stopping pipes transport, combustion, decrease properties accelerating the corrosion rate, stopping flow

filters and especially the emergence of errors in reading apparatus quality control of oil.
Precisely why the airline industry have introduced quality standards to ensure a smooth
operations of aviation fuels. To maintain the quality of these products is necessary to store oil kerosene of sterile conditions in Aviation (what is doable) or maintenance activity of micro-organisms to a level at which their development, not to bring damage to air operators.
This material are intentions to studying the behaviour of oil and petroleum products (by especially kerosene) contact with bio acids.
These microorganisms are geared to the conditions of the water found in petroleum research on microbial metabolizing farm of hydrocarbons acknowledging the results obtained through the issue of the effects of a biological, chemical or organic.
Metabolic pathways of degradere hydrocarbons consisting in the production of enzymes and depraved surfactantilor after which specific forms of oil emulsions. Biosurfactants are byproducts of yeast and bacteria Gram negative and positive. The final products are carbon dioxide and water, but it forms the final aldelhide as byproducts, ketones, alcohols and organic acids (which are more than hidrocarburiile intiale oxidizable).
Alkanes with linear short catena (C2-C8) of Mycobacterium paraffinicum are byodegradations or Pseudomonas species [D. Daylarde, E. Saccol, 1996]. Alkanes with long isomery storable representation (C9-C20) are metabolizations of Pseudomonas, Micrococcus, Actinomyces, Torulopsis Candida, Penicillium, Aspergillus, Hormonicus. Alkanes Branched are with metabolizations of isomery Corynebacterium. Cycloparafines are treated as species of Pseudomonas and Nocardia. Degradation of olefines by breaking doubles is the connecting links. The arenas are the source of carbon for microbial species of Pseudomonas, M., Hormonicus.
The petrochemical industry is due to replacement of microbial contamination of stored products contaminated water, this water vapor in the storage area, lack of proper evacuation of oil (when the outlet is in the aqueous sediment storage). Water storage area is an essential factor for development of microbial cultures. At the interface between water and oil are developing microbial cultures in water due to dissolved oxygen, carbon found in oil and mineral elements from water and oil as the growth and development of microorganisms. This ensures the development of aerobic organisms oxygen, but when the culture decreased oxygen using anaerobic microbial metabolites obtained in aerobic processes. Following the development of these crops to eliminate hydrogen sulfide gas corrosive. To note that when biocenosis formation, microbial degradation occurs rapidly and cultures death is submitted to a slurry tank bottom stick. Also as metabolites of microorganisms with an occurrence of surfactant action on blood interaciale water-oil. Reducing this tension leads to increased water solubility in oil and petroleum product so turbititatii increase.
One problem is the use of contaminated oil formation of biopolymers on injectors or filters due to increased cell mass. Also microbial growth additives that destroy the structure of nitrogen or phosphorus (D. Popescu, 2004)

2. Experiments

To observe the behavior of oil contaminated with microbial cultures were collected 5 samples of such storage tanks:

a. sample of oil with a density of 0.870, 0.05% water and 1.3 sulfur,
b. A sample of kerosene
c. A sample of water from storage tank kerosene,
d. A sample of water from crude oil storage tank,
e. A sample of sediment from the oil storage tank.

All samples were examined with an electronic microscope X 1000 aiming at the opalescent oil, viscosity and content of suspensions in water sample odor and the amount of suspension and the interface water / oil emulsification and transparent tape.

The degree and type of contamination was performed according to ASTM D 5465-93 method. The method consists in determining the growth of colonies at the same temperature on a contaminated sample. Sample set for analysis is emulsified in a sterile Ringer solution and homogenized in a sterile Petri agar melted and flooded the flat surface of solid agar. Grown colonies are counted to estimate the degree of microbial contamination of samples tested, results are reported in units colony per milliliter (cfu / ml). Also we studied the effect of bioacid crops by liquid chromatography analysis. To reduce microbial cultures was used consisting of chlorine and methyl bioacid combined with izotiazolin (5-chloro-2-methyl-4-izotiazolin-3-one).

3. Results obtained

Samples of the oil tank were analyzed and were found on these microbial populations:

Sample of oil-Flavobacterium leiagnothi, resinovorum Flavobacterium, Flavobacterium and Pseudomonas flavescens Alcaligenes.

Water samples: Pseudomonas fluorescens.

Sampling of kerosene tank was analyzed and these were identified microbial cultures: Tetracoccus sp. Micrococcus sp. And Acinetobacter lwoffii.

Also contains water: Flavobacterium Flavobacterium denitrificans gelatinum Acinetobacter parvulum Flavobacterium indologenes Pseudomonas fluorescens

All bacteria are identified in the literature.

To inhibit growth of microorganisms was used bioacid made of a mixture of chlorine, methyl izotiazolin (5-chloro-2-methyl-4-izotiazolin-3-one).

This bioacid was used in composition of 150 ppm, 100 ppm and 50 ppm to 1 liter samples aiming at:
A. Evolution of microbial populations,
B. Quality of kerosene,
C Quality oil.

To study the evolution of microbial populations were formed 24 samples collected every 4 of each sample.
Were treated with 3 samples of each product bioacid microbial populations and behavior followed for 3 weeks.
The results are:

First sample:

Crude :
- the first day -1.8 x 102 CFU / ml,
- the first week, -3.6 x 102 CFU / ml,
- second week -7.2 x 102 CFU / ml,
- third week -10.4 x 102 CFU / ml,

Water in oil:
- first day -2.3 x 104 CFU / ml,
- the first week, -4.6 x 104 CFU / ml,
- second week -6.9 x 106 CFU / ml,
- third week -10.3 x 106 CFU / ml,

Kerosene:
- first day -3 x 103 CFU / ml,
- the first week, -6 x 103 CFU / ml,
- second week -9 x 103 CFU / ml,
- third week -12 x 103 CFU / ml,

Water in Kerosene:

- first day of -5 x 105 CFU / ml,
- the first week, -6 x 105 CFU / ml,
- second week -7 x 105 CFU / ml,
- third week -8 x 105 CFU / ml,

Treatment with 150 ppm bioacid

Crude

-First week, -5 x 10 CFU / ml,
-Second week -3 x 10 CFU / ml,
-Third week -2 x 10 CFU / ml,

Water in oil:

-First week, -1.5 x 102 CFU / ml,
-Second week -1 x 102 CFU / ml,
-Third week -0.3 x 102 CFU / ml,

Kerosene:

-First week, -2 x 10 CFU / ml,
-Second week -1 x 10 CFU / ml,
-Third week -0.8 x 10 CFU / ml,

Water in Kerosene:

-First week, -2 x 103 CFU / ml,
-Second week -1 x 103 CFU / ml,
-Third week -0.5 x 103 CFU / ml,

Treatment with 100 ppm bioacid

Crude
-First week, -1 x 102 CFU / ml,
-Second week -0.8 x 102 CFU / ml,
-Third week -0.5 x 102 CFU / ml,

Water in oil:
-First week, -3 x 103 CFU / ml,
-Second week -2 x 103 CFU / ml,
-Third week -1 x 103 CFU / ml,

Kerosene:
-First week, -0.5 x 102 CFU / ml,
-Second week -0.3 x 102 CFU / ml,
-Third week -0.1 x 102 CFU / ml,

Water in Kerosene:

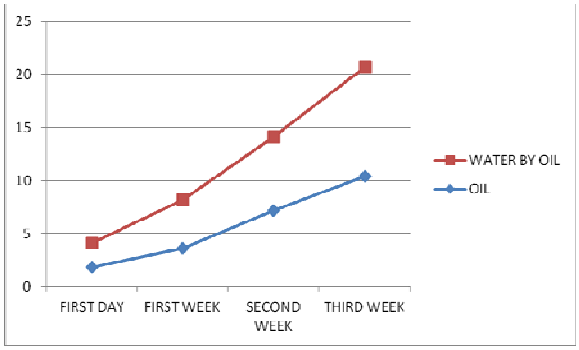
-First week, -2 x 102 CFU / ml,
-Second week -1 x 102 CFU / ml,
-Third week -0.5 x 102 CFU / ml,

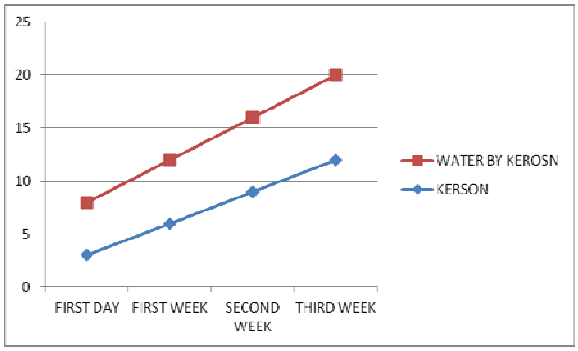
CONCLUSIONS

Samples were collected from two reservoirs, namely oil and kerosene.
Microbial populations were analyzed in four stages, namely the oil, water from oil, kerosene and the water in kerosene.
Note that water samples contain more pollutants than product samples.
Treatment with a form of chlorine and methyl bioacid reduce populations of microbial cultures.
Also bring a higher content bioacid microorganism cultures maintain a low level.
Need a larger amount of bioacid but product quality decreases

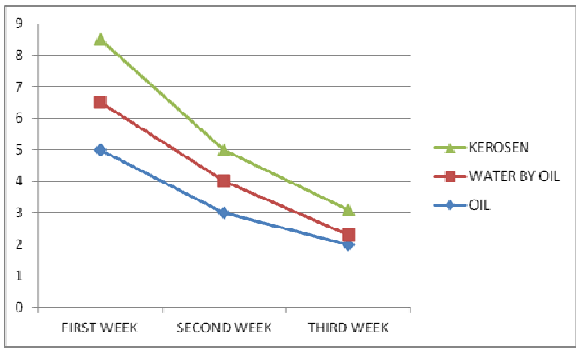
REFERENCES

1. - Fuel analysis. RL 900 Test Methods 26,
2. T.Chis-Efects of oil and kerosene to microroganisme, SGEM Conference, Varna, 2012,
3. CDNenitescu - Organic Chemistry, Vol 1, Didactic and Pedagogic Publishing, Bucharest, 1980,
4. Christine Gaylarde, Enilson Saccol L. To, Peter M Gaylarde - LABS 2 - Biodegradation and Biodeterioration in Latin America, Brazil, March 1996
5. D. Popescu-control study of microbial contamination of jet aviation fuel, oil and Environment Conference, Ploiesti, 2004





EVOLUTION BY MICROBIAL TO SAMPLE



EVOLUTION BY MICROBIAL TO SAMPLE TRATED BY 100 PPM BIOACID