Abstract

Microbial contamination of fuel has been the cause of several problems in transportation and storage of these products. Due to the lack of previous studies related to these problems in Costa Rica, bacterial quality was evaluated biannually in automotive fuels stored in the four oil distribution facilities of the Costa Rican Petroleum Refinery (RECOPE). In 12 oil storage tanks, for a total of 96 samples, mesophilic, heterotrophic aerobic/facultative counts (ASTM D6974-04) and identification of bacteria presented in regular gas, premium gas and diesel from the bottom and superior part of the tanks were done; in the samples containing an aqueous phase, sulfate reducing bacteria (SRB) were also quantified by the most probable number technique (MPN), according to the ASTM D4412-84 standard. The higher contamination was shown at the bottom of the tanks (populations up to 10^4 UFC/l), especially if there was accumulated water, in which case populations reached 10^8 UFC/l. The most contaminated fuel was diesel (counts up to 10^4 UFC/l), whereas the less contaminated was premium gas. The less contaminated fuels were from the facilities of La Garita and Barranca, whereas the most contaminated were from Ochomogo. Nevertheless, the quantified populations did not cause significant alteration in quality physicochemical parameters in the samples analyzed. A total of 149 bacterial strains were isolated, 136 (91.3%) Gram positive and 13 (8.7%) Gram negative. The most frequent genera were Staphylococcus (24.0%), Micrococcus (21.9%), Bacillus (18.8%) and Kocuria (11.5%) among Gram positive bacteria and Pseudomonas (7.3%) among Gram negative bacteria. The majority of these genera have been found as fuel contaminants or even as degraders of this kind of products; nevertheless, some species for which their appearance or growth in hydrocarbons have not been described were found with low frequencies. SRB were present in counts up to 10^5 MPN/l in 42.9% of water containing samples (including all from diesel tanks), indicating biocorrosion processes risk in fuel transport and storage systems. From the findings in this study it is recommended to give a frequent maintenance to fuel containers, based on continuous drainage and removal of accumulated water, antimicrobial agent addition and microbial quality monitoring in country's fuels.

Keywords

Fuel, microbial contamination, fuel storage tanks, sulfate reducing bacteria, biocorrosion.