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ENVIRONMENTAL NEWS
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ETHANOL IN WATER

INTRODUCTION

The use of ethanol sourced from crops such as sugar or grain appears on the surface to be an attractive and environmentally friendly means of reducing fossil fuel consumption. In recent years, the addition of ethanol to petrol in significant proportions has become commonplace.

After much controversy over the potential for damage to vehicle engines, Government regulation has limited the ethanol content in fuel to 10%.

While this debate has raged, little thought has been given to the environmental side effects of this seemingly 'green' initiative.

ENVIRONMENTAL CONSEQUENCES OF ETHANOL IN PETROL

The leakage of fuel and solvents from underground storage tanks is a well-known cause of groundwater contamination. Groundwater is a critical element of the water cycle from many perspectives including the protection of aquatic ecosystems, human consumption, stock watering and irrigation of crops.

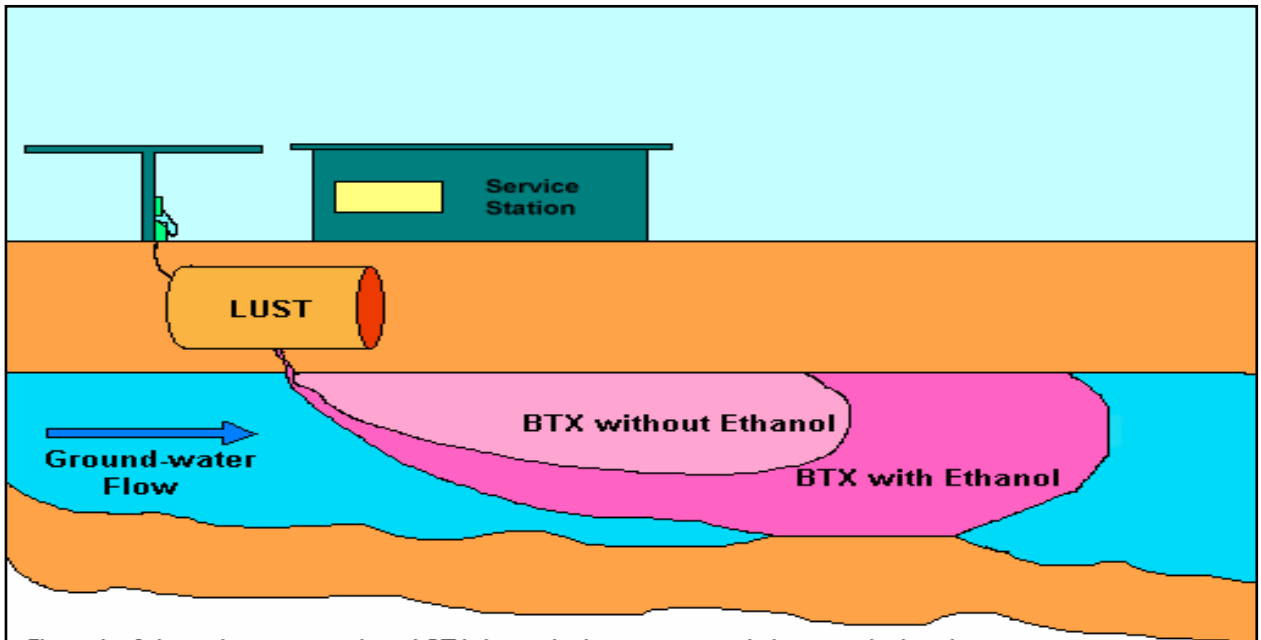

Figure 1. Schematic representation of BTX plumes in the presence and absence of ethanol. BTX compounds are mobile when dissolved in ground water. Since the compounds are partially soluble they spend part of the time adsorbed to the stationary substrate (for example sand grains) or dissolved in the mobile phase (ground water). The cosolvent effect of ethanol results in the BTX compounds spending more time in the mobile phase and hence moving further in a given time than would the same compounds under the same circumstances in the absence of ethanol.

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Prior to even considering the groundwater system, the impact of ethanol in a fuel storage tank must be considered. It is well documented that the presence of oxygenates (such as ethanol) in fuel significantly increase the corrosive potential of the fuel towards metal surfaces. It follows then, that an increase in the frequency of leakage from underground storage tanks could be the first unforseen side effect of ethanol addition.

A low concentration of ethanol (alone) in groundwater will have little or no effect on the environment. The key issue is that ethanol is BOTH highly soluble in water AND an excellent solvent for dissolution of the common hazardous compounds like Benzene, Toluene and Xylene (BTX) in fuels. These two properties make ethanol an efficient co-solvent that increases the solubility of these BTX compounds in water. As a consequence, greater amounts of the hazardous compounds from a fuel plume (resultant from LUST) are likely to be carried into the groundwater system. Since in this context solubility is synonymous with mobility, the net effect of the ethanol / fuel mix would be an increase in the mobility, and hence the potential for greater concentrations, of hazardous compounds in groundwater systems.

GUIDELINE VALUES

Currently there is no guideline value for the concentration of ethanol in groundwater. However, knowledge of the presence of ethanol can be a useful predictor to the mobility of environmentally significant contaminants.

ANALYTICAL SERVICES

ALS Environmental has developed a method using Purge & Trap, Gas Chromatography /Mass Spectrometry for the determination of ethanol in water and soil. Analytical difficulties associated with the high solubility of ethanol in water as well as the polar nature of the analyte have been overcome by using a heated purge and a highly polar column for the determination.

The method has been granted NATA accreditation and levels of reporting of 0.1 mg/L (water) and 5 mg/kg (soil) are achieved.

RERERENCES

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