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Treatment with 1-butanol in reclamation of used oils

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ABSTRACT

This paper indicates the health concerns which have been expressed regarding the handling, re-use and disposal of used lubricating oils and discusses the factors which are believed to be relevant to these concerns. It also indicates the current and developing situation with regard to legislation in this area discusses briefly the disposal of used oils and sets out the views of the industry sectors most involved. If used oil is not disposed of properly, there is a risk that it and any other substances that it may contain will enter natural cycles and the food chain via water, soil and the air.

Key words: Used oil, regeneration, environmental problem.

INTRODUCTION

Waste lubricant oils are generated from vehicles and machineries. This waste lubricating oil has higher values of ash, carbon residue, asphaltenic materials, metals, water, and other dirty materials; which are built during the course of lubrication inside the engine. Wang *et al.*[1] showed the stability of asphaltene. The addition of compounds with molecules that differ greatly from resins in terms of size and structure, and therefore, solubility parameter, shifts the equilibrium that exists in the non-asphaltene portion of the oil. It is found that normal alkane liquids are often added to oils in an attempt to reduce heavy oil viscosity. The result of this introduction is an alteration in the overall characteristics of the oil making it lighter. Asphaltenes are polar compounds and could be stabilized by the presence of resins. Lichaa[2] showed the critical concentration of resins below which the asphaltene flocculates may precipitate and above which they cannot precipitate regardless of how much the oil mixture is agitated, heated, or pressurized. When the oil is diluted with normal alkane, the amount of asphaltenes precipitated depends on the number of carbons of the solvent. In the normal alkane environment, asphaltenes flocculate and then precipitates into solid phase. The solid phase is a result of particles such as porphyrin, carbon, sulfur, etc. connected to the asphaltene. Vazquez[3] and Juan[4] showed that by introduction of additional alkane, the asphaltenes flocculate because they are swelling until they are breaking down and precipitate out of the solution. Battalova and Likerova[5] showed that the best adsorbent for the finishing process of lubricating oil is the acid activated bentonite clay, but the mechanism of their action on the components of petroleum oils has not been clarified. They examined the bentonite with and without the addition of 10% sulfuric acid. They showed better properties of the finished lubricating oils. Araujo and Telles[6] showed that the final treatment of the used oil recycling process is the decolorization and neutralization. The compounds removed at this step are mainly products of the oxidative degradation of base oil, such as organic acids, esters, ketones, etc. They conducted their experiments at controlled temperatures using a batch reactor with a good mixing property. They prepared the oxidized oil and then treated with three different adsorbents at two different temperatures.

Chemistry of lubricating oils

Deterioration of oils

This is associated with the presence of air and leads to the formation of gums, corrosive acids, or varnish like products.

Chemistry of solvent treatment

Solvents used in refining petroleum include 1- butanol, 2-propanol, Methyl Ethyl Ketone and Methyl Iso Butyl Ketone. 1-Butanol is the most commonly used solvent in the petroleum refining .This is due to the low cost of solvent, its availability, maximum sludge removal and the versatility of its action. The action of 1- butanol solvent on petroleum is highly complex; it acts like a polymerizing, precipitating, oxidizing, hydrating and solvent refining agent.

Chemistry of clay treatment

Absorbents may be defined as solid substances capable of retaining on their surfaces gases, liquid or materials dissolved in solvents. Adsorbents find the most extensive use in decolorizing oils. Color pigments are adsorbed on the surface of the adsorbents, therefore, particle size becomes of prime importance in the process of color removal. Bleaching by adsorbents is certainly a surface phenomenon, more finer are the particles of clay, more is its efficiency but if mesh size of clay is increased beyond a particular level, the removal of adsorbent becomes a problem. They are employed successfully for desulphurization. They may be utilized for separating petroleum into fractions of different chemical composition. Natural adsorbents are represented by minerals like fuller's earth, bentonite, magnetite, bauxite and special clays. Clays are very effective to remove water and suspended impurities from the oil, acting as dehydrating and clarifying agents. Resinous and asphaltic substances are removed by the clay with the resulting improvement in colour of the oil. The natural clay behaves particularly at higher contacting temperatures. At high temperature, the colour of the oil improves as the time of contact increases up to about 20-30 minutes. On further heating, the colour begins to darken and reaches a maximum after contacting the oil with clay for approximately 60 minutes. On still further heating, the colour shows again an improvement, tending to approach a constant value. This is due to the fact that several simultaneous reactions occur between oil and clay. At first the adsorption of the coloring matter by the clay appears to predominate but a point is finally reached where the development of new coloring matter, due possibly to polymerization, becomes of greater moment. Finally, cracking reactions overshadow the two other reactions and bring about an improvement in the colour of the oil because of decomposition of the polymerized products

Used oil is a valuable resource

Used oil can be re-refined as lubricating oil, used as a clean fuel and reprocessed to create many petroleum-based products. Recycling it saves this non-renewable resource for future use.

Improperly disposed of, it's Harmful

America's worst oil spill isn't noted much in the news because it is spread all over the U.S. The EPA estimates that 200 million gallons of used oil are dumped on the ground, tossed in the trash (ending up in land fills), and poured down storm sewers and drains every year. Just one gallon of used oil, the amount from a single small auto engine, has the potential to contaminate up to one million gallons of fresh water – a year's supply for 50 people. A single gallon will create an eight-acre oil slick. It will poison fish and reduce the oxygen produced by aquatic plants.

Used lube oil re-refining

The release of used lube oil or motor oil can have adverse effects on the environment. Just one gallon of used oil can make a million gallons of fresh water undrinkable. When used oil is poured down the drain and enters a sewage treatment plant, a very small concentration of oil can foul the treatment processes. A film of oil on a water surface prevents oxygen from entering the water and blocks sunlight. This makes it difficult for plants to grow, thus reducing the animal and plant life in a body of water. Water, air and soil are all connected, and oil can make its way to these media. Therefore, used oil and sludge in any of these bodies of water can harm human beings or kill fish, birds, and other wildlife. Researches carried out on this in United States, proves that the motor oil from just one oil change can contaminate a million gallons of drinking water. Research on waste used oil lubes management in Africa noted that the indiscriminate

dumping of the aforementioned used waste oil lubes, and (sludge from crude oil in producing countries), and not excluding solid wastes, are major remote obscured starting origin of the River Blindness, Malaria, Elephantiasis, Hepatitis-B, Cholera, Dysentery / Diarrhea, TB Tuberculosis, sleeping sickness from Tsetse fly, deadly mosquitoes, and a lot of other viruses and or diseases, through the contamination of food, water, air, land and the rest of our ecosystem. Because of these risks, proper management of used oil lubes and other wastes is a major environmental concern. The indiscriminate dumping of the used lubricating oil (Waste Used Oil Lubes) by end users and lube oil changers from automobiles and equipments etc has totally annihilated our entire ecosystem due to lack of knowledge of the Re-refining Technology, and which is the basis and pivot where this proposal stands. The monumental conservation disaster and or environmental effluence in India and some African countries caused as a result of lack of the knowledge of the used oil lubricants and sludge re-processing or re-refining technology and incinerators for solid wastes, are so ugly for discussions from the angle of unplanned healthy and environment priority in India. As such, the EPA, Western countries and some Asian developing countries said that environmental friendly, cleansing and protecting projects are no more considered as luxury and or self money making projects, but as priority viable life, and ecosystem saving projects[7-11].

CONCLUSION

In most developing countries the situation relating to the disposal of used oil is unsatisfactory. If oil is dumped on the ground after use, as is often the case, seepage occurs, after which layers of the soil and above all groundwater resources and drinking water wells may be contaminated. Because of the possible content of extremely toxic halogen compounds, this practice is hazardous to health. Good management of oil and used oil reduces environmental and health risks to a large extent and makes the greatest possible use of the energy content of the natural resource that is crude oil. Good management is taken to mean dealing with it responsibly and in an environmentally acceptable way.

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