ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 8, Issue 12 , December 2021

The Process of Regeneration of Used Engine Oils Using Nanomembranes

Aliev Abror Akbarovich, Aslonov Adizkhon Akhrorovich, Urinov Abror Akhrorovich

Institute of General and Inorganic Chemistry of the Academy of Sciences of the Republic of Uzbekistan;
Bukhara Engineering Technological Institute
Bukhara Engineering Technological Institute

ABSTRACT: In this article, it is proposed to remove finely dispersed products of aging oils using new methods of periodic cleaning will extend the service life of oils. A new complex technology has been analyzed, which includes mechanical filtration, centrifugal separation and nanofiltration**.**

KEYWORDS: used engine oil, regeneration, mechanical filtration, centrifugal separation, nanofiltration, membrane.

I. INTRODUCTION

Regeneration is the most preferred way for the environment to dispose of waste oil. This is a type of treatment in which all pollutants are removed from the waste oil. The result of regeneration is used to produce the same oil. This allows you to extend the service life of lubricants, save raw materials and preserve the environment.

Waste oils contain various metals, aging products, naphthenic, paraffin, aromatic hydrocarbons, resins, mineral acids, mineral dust, asphalt-resinous products, esters.

As soot, resins, asphaltenes accumulate, the engine oil begins to age intensively. This affects the service life of the oil, affects the technical and economic performance of the engine and the car as a whole [1].

II. MATERIALS AND METHODS

Existing methods of separation and purification of oils do not allow the removal of aging products together with mechanical impurities. This proves the need to develop new methods of separation and purification of waste oils. Existing cleaning methods do not allow to completely remove asphalt-resinous compounds and oxidation products.

The removal of finely dispersed oil aging products using new methods of periodic cleaning will extend the service life of oils.

The main obstacle to improving the cleaning of used engine oils is the presence of detergent-dispersing additives in them. These additives do not fully work during the operation of oils and keep the contamination in a suspended state. As a result, adsorption, mechanical filtration and other types of purification are ineffective. Traditional cleaning methods - mechanical, chemical or physico-chemical do not provide the necessary cleaning efficiency [2].

Currently, new methods of regeneration of used motor oils using membrane separation are being developed.

Membrane processes are separation processes carried out on semipermeable membranes under the action of an applied driving force. The most common industrial membrane processes include ultra-, micro-nanofiltration and reverse osmosis.

The main feature of these methods is the presence of a semipermeable membrane, which has preferential permeability with respect to certain components of the separated mixture. Currently, baromembrane processes are widely used in water treatment systems, in the concentration and fractionation of solutions, for desalination of salt water, purification of various liquid waste. Membranes and other filtering materials can be considered as semi-permeable media. They let water through, but they don't let some impurities through. However, if conventional filtration is used to remove relatively large formations from the water – dispersed and large colloidal impurities, then membrane technologies are used to extract small colloidal particles, as well as dissolved compounds. To do this, the membranes must have very small pores [3].

Membrane technologies refer to reliable, efficient and economical methods of separation and purification of used engine oils. Filters of the purification system using nanofiltration are quite simple, their main element is a nanomembrane.

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 8, Issue 12 , December 2021

The driving force causing the liquid to penetrate through an obstacle in the form of a thin partition can be applied pressure, the difference in concentrations of dissolved substances, the temperature difference on both sides of the partition, the electromotive force.

The main difference between membranes and conventional filter media is that they are thin, and the impurities removed are retained only on the surface of the membrane.

Microfiltration membranes have a pore size from 0.1 to 1.0 microns. They retain fine suspensions and colloidal particles. Such membranes are used for coarse cleaning, or for preliminary preparation before finer cleaning.

Ultrafiltration membranes have a pore size from 0.01 to 0.1 microns and usually operate at pressures of 2-5 bar. They remove large organic molecules, colloidal particles. They are used, for example, for the post-treatment of drinking tap water from colloidal and high-molecular impurities, if no adjustment of its salt composition is required, such membranes provide a consistently high quality of purification without changing the basic mineral composition. Reverse osmotic membranes have pores with a diameter of less than 10 nanometers (less than 0.01 microns), operate at pressures up to 100 bar and allow deep desalination, or demineralization. Reverse osmosis is used to obtain ultrapure water, as well as for desalination of marine and brackish groundwater. Reverse osmotic membranes contain the narrowest pores. They retain most of the organic substances and dissolved salts, including iron [4].

The process of filtering solutions under pressure exceeding osmotic pressure through semipermeable membranes that pass the solvent and retain the solute is called nanofiltration. Nanofiltration membranes are characterized by a pore size from 0.001 to 0.01 microns. The main advantages of the nano separation method are a high degree of purification, stable quality, versatility of the method, small dimensions of installations, long service life of membranes.

Nanofiltration membranes are the most effective, as they capture fine inclusions.

The device and complex technology of concentration, separation and purification of waste oils are proposed with an optimal combination of baromembrane methods with traditional methods of purification of used motor oils. The new integrated technology includes mechanical filtration, centrifugal separation and nanofiltration. This makes it possible to ensure a high degree of waste oil purification and reduce the amount of lubricants disposal, which will improve the environmental situation. The current state of the membrane market shows a steady trend towards expanding the scope of application of nanofiltration membranes. The development of a new method - nanofiltration with a high ability to capture fine inclusions allows this method to be used for cleaning used engine oils.

The effectiveness of nanofiltration membranes is due to a sharp decrease in the concentration of organic pollutants, both high-molecular and low-molecular. This is especially true of organochlorine substances that are dangerous to human health.

Nanofiltration membranes provide high-quality purification and separation of used motor oils, and this leads to a reduction in the energy intensity of processing production and to a reduction in waste emissions into the environment. The processes of nanofiltration separation depend on the properties of the membranes, the flows in them and the driving forces. For these processes, the nature of the flows to the membrane from the side of the separated media and the discharge of separation products from the opposite side is also important. The fundamental difference between the membrane method and traditional filtration methods is the separation of products in the flow, i.e. separation without precipitation of sediment on the filter material, gradually clogging the working porous surface of the filter [5].

Regeneration is the most preferred way to dispose of waste oil for the environment. The result of regeneration is used to produce the same oil. This method helps to save raw materials and is environmentally friendly. With careful implementation of the regeneration technology, the quality of the oil differs little from the new oil. To obtain the necessary viscosity, the oils are mixed and additives are added to them, as in the production of new commercial oils. The yield of regenerated oil reaches 75-80%.

It is possible to regenerate motor, hydraulic, industrial waste oils.

The nanofiltration process can become a new and promising method for the regeneration of waste oils. Namely, nanofiltration membranes are increasingly used to purify water, oils and other waste. The most promising are membranes made of inorganic materials, polymer metal-ceramic, ceramic and carbon.

Membrane separation processes, such as microfiltration, ultrafiltration, nanofiltration, are more efficient and economical than traditional separation methods. The concept of the membrane method will solve the problems of incomplete utilization of raw materials and the transition to a continuous production method.

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 8, Issue 12 , December 2021

III. CONCLUSION

The need to regenerate used engine oils is beyond doubt, since their destruction and burial creates even greater problems than the oils themselves. Regenerated motor oils are valuable secondary raw materials, they can be used as boiler fuel, lubricant for tractors and other heavy construction equipment, for the production of construction bitumen.

REFERENCES

1. Baltenas A.S., Safonov A.S. Motor oils - SPb.:Alfa-Lab, 2011.-272 p.
2. Shashkin P.I., Bray I.V. Regeneration of used petroleum oils. -M.: Chemistry, 2006. - 304s.
3. Pakhotina I.N., Osadchy Yu.P., Pakhotin N.E. Baromembrane separation and purification of used motor oils. Young scientists for the development of textile and industrial cluster (Search-2015): Proceedings of the Interuniversity Scientific and Technical Conference with international participation. - Ivanovo: IVSPU, 2015. - pp. 221-222.
4. Pakhotin N.E., Pakhotina I.N., Osadchy Yu.P., Separation of liquid polydisperse systems by ultrafiltration// Innovations in construction through the eyes of young specialists: Collection of scientific papers of the International Scientific and Technical Conference.- Kursk: SWSU, 2014.With. 249-250.
5. Pahotin N. E., Photina I. N., Osadchy, Y. P., New regeneration technology of waste engine oil//1st international scientific-practical conference "Problems and innovations in the field of mechanization and technologies in construction and road areas", Saratov state technical Univers