

EFFECT OF SM-400 ACTIVATED CLAY ON THE CHEMICAL PROPERTIES OF USED TRANSFORMER OIL

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ABSTRACT

Transformer oil is mainly used in electrical transformer. It contains the mixture of higher hydrocarbons. In used transformer oil, physico-chemical parameters of the oil are changed. This parameter can be restored by the adsorption treatment on used transformer oil. There are changes in properties like kinematic viscosity, acidity, Sp.gravity, Diesel Index, pour point etc. These properties were studied after reclamation of used transformer oil.

Keywords: Chemical properties, Transformer oil, Adsorption, Reclamation etc.

INTRODUCTION

Transformer oil is thick petroleum product obtained in the refining industry. It contains the mixture of higher hydrocarbons¹. Due to continuous use in transformer, the physico-chemical properties² of the transformer oil are changed and thereafter oil gets deteriorated. After deterioration of oil and its continuous use, there is a possibility to damage the transformer.

The properties like kinematic viscosity, Pour point, sp. Gravity, are changes². Such deteriorated transformer oil can be purified or reclaimed by using certain adsorption treatment with suitable adsorbent³. After adsorption the properties of reclaimed oil are studied by international testing methods. After analyzing some chemical properties, it can be concluded that whether used transformer oil should be reused again or not.

EXPERIMENTAL SET UP

Adsorption of used transformer oil was carried out in batch reactor⁴. For this the reactor was filled with known quantity of used transformer oil. This reactor was placed on heating mantle so that the adsorption can be carried out at different temperature. The round bottom flask can be used as a batch reactor where the adsorbent was treated with used transformer oil.

Stirrer was introduced in the batch reactor or round bottom flask in order to maintain the uniform mixing of adsorbent with used transformer oil. In this adsorption method sm-400 activated clay was used as an adsorbent. The adsorption was carried out for one hour with different amount.

After adsorption, filtration was carried out and filtered oil was stored in different sample bottles.

Different physico-chemical properties were determined as per BIS specification standard⁵.

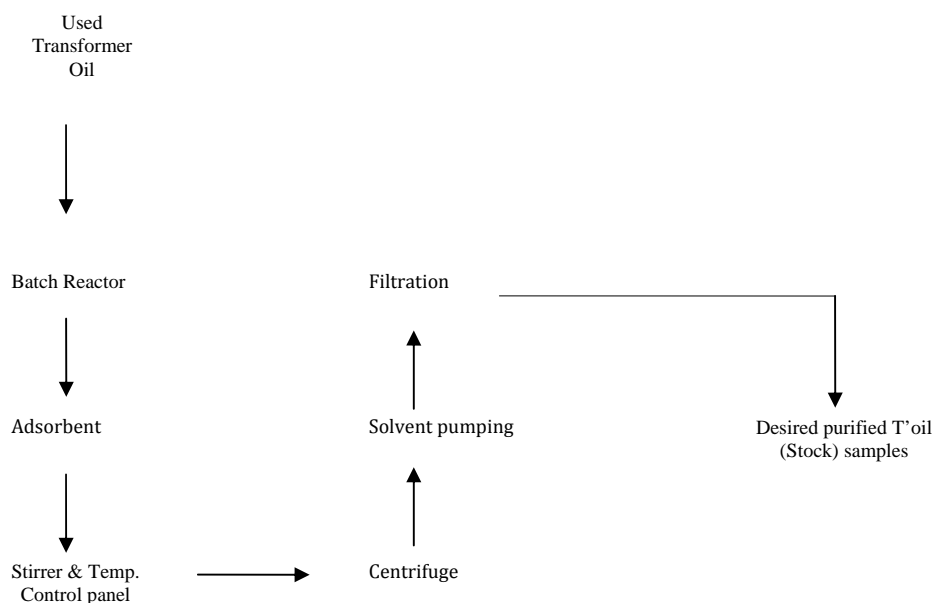


Fig. 1: Schematic diagram of batch reactor for adsorption

Table 1: Physico-chemical properties without adsorbent and with adsorbent

S.No.	Properties	Without adsorbent	After adsorption (amount)		
			1%	2%	3%
1.	Sp. gravity (g/ml)	0.9884	0.8397	0.8194	0.7980
2.	Surface tension (d/cm)	48.54	50.69	49.06	47.42
3.	Diesel Index	19.96	70.89	69.51	67.58
4.	Kinematic viscosity (Cs)	21.81	15.30	14.24	13.13
5.	Pour point (^o C)	4	3	3	2
6.	Aniline point (^o C)	82	91	90	88
7.	Acid value	2.019	0.561	0.494	0.448

RESULTS AND DISCUSSION

After adsorption of used transformer oil by adsorbent Activated clay, tremendous changes in some chemical properties were observed.

Sp. gravity of used transformer oil was decreased after adsorption. It means that transformer oil become lighter due to the removal of impurities.

Diesel Index shows increase after adsorption. This indicates that thick transformer oil become thin and tries to acquire chemical properties of diesel by removing some higher hydrocarbons.

Kinematic viscosity decreases after adsorption, this indicate oil become more viscous and purify to some extent by using activated clay as adsorbent⁶.

Decrease in pour point values confirm that some paraffin wax was removed.

Aniline point is increased after adsorption with activated clay. The value decreases with the increase in the amount of adsorbent. It removes more aromatics contents from the used transformer oil.

Acid value (KOH/sample) of the used transformer oil decreases tremendously with the increase in amount of adsorbent. This shows less deterioration is present in 3% amount of adsorption. Hence, oil gets purified to certain extent.

CONCLUSION

From the above discussion it concludes that used transformer oil get purified to some extent by adsorption method. Above physico-

chemical properties after purification were observed and then compared with standard BIS specification. From the above data obtained after adsorption, it is clear that the used transformer oil is purified by the application of adsorbent sm-400 activated clay⁷. Quantity of used oil decreases during adsorption. It is eco-friendly and has green chemistry applications. This saves a lot of expenditure by purifying waste transformer oil.

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