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Spectrometric Analysis of Lubrication Oils used in Spinning Industries

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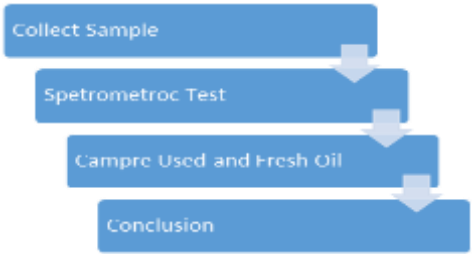
Abstract - *LUBRICATION system is critical in many industries & it is equally important in the textile industry. The basic problem in the lubrication of Textile Machinery is that the product comes into intimate contact with the machine parts & any contamination of the product or the lubricant cannot be tolerated. The paper focus on the spectrometric analysis of the different oils used in different spinning machines*

Key Words*: *spectrometric analysis, spinning machine oils, Lubrication, FTIR

1. INTRODUCTION

Present day, textile machines are becoming more & more sophisticated & complex with the use of various types of drives, components moving at widely varying speeds & working under different loads. Therefore, is becoming more & more critical in maintaining both the efficiency & reliability of machines & there by, the quality of the finished product. It has been observed & confirmed that a majority of the problems & breakdown on machines occur due to faulty lubrication so it becomes essential to monitor the oils to identify the oil degradation and also wear and tear of the machine parts. FTIR spectroscopy is used for the testing of the oil samples. Fourier transform infrared spectroscopy (FTIR) identifies chemical bonds in a molecule by producing an infrared absorption spectrum. The spectra produce a profile of the sample, a distinctive molecular fingerprint that can be used to screen & scan samples for many different components. FTIR is an effective analytical instrument for detecting functional groups & characterizing covalent bonding information.

2. PLAN OF WORK



3 TESTING

Fourier transform infrared (FTIR) spectroscopy is a versatile tool used to detect common contaminants, lube degradation byproducts and additives within lubricating oils. When exposed to infrared radiation, molecules absorb radiation at very specific wavelengths. Knowing this, you can pass infrared radiation through a sample and use a detector on the other side of the sample to identify the molecules found in that sample.

Much like a fingerprint, no two molecules produce the same pattern or wavelength. This is very useful in being able to identify the material composition of a sample. Qualitative analysis becomes easy because of this fact. When a software algorithm is used to plot the resulting spectrum, a visual representation is generated. The size of the peaks is a direct indication of the amount of the specific material found in the sample.

Table -3.1: Sample oils used

SR. NO	NAME OF OIL	TYPE	DURATION IN MONTH	GRADE
1	Carding Oil	Fresh	-	32
2	Carding Oil	Used	3	32
3	Rsb/Comber	Fresh	-	629
4	Rsb/Comber	Used	4	629
5	Speed Frame Spindle Oil	Fresh	-	150
6	Speed Frame Spindle Oil	Used	2	150
7	Ring Frame Gear Oil	Fresh	-	320
8	Ring Frame Gear Oil	Used	3	320
9	Ring Frame Spindle Oil	Fresh	-	E10
10	Ring Frame Spindle Oil	Used	3	E10

Since most used oil samples are complex mixtures of thousands of different molecules, including base oil molecules, additives, oil degradation byproducts, wear debris and contaminants, the infrared spectrum of the sample is typically complex and can be difficult to interpret with any degree of certainty, as some wavenumbers may overlap. Despite these drawbacks, FTIR still has great value in used oil analysis and is employed by the majority of oil analysis labs as a screening tool.

4. RESULT AND DISCUSSION

4.1 Carding Oil

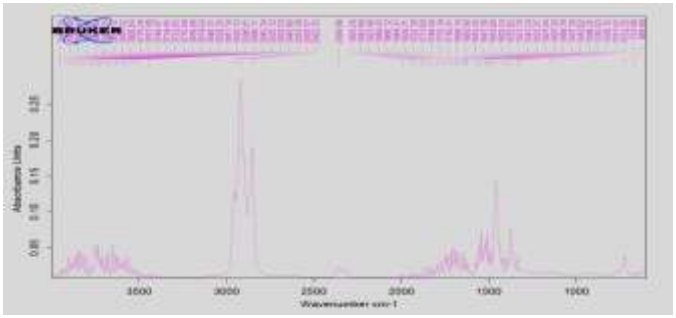


Fig 4.1.1 Carding Fresh Oil

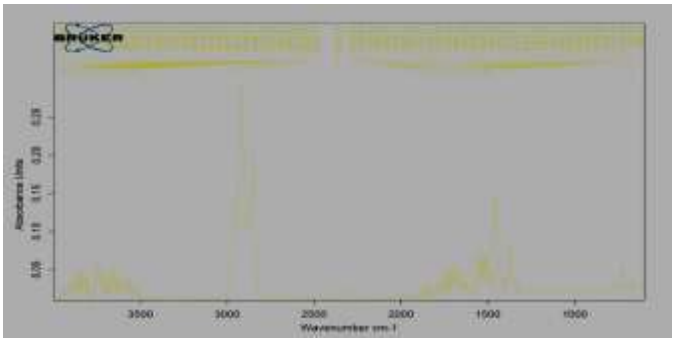


Fig 4.1.2 Carding Used Oil 3 Months

Fresh oil
Name of oil- carding fresh oil Grade of oil- 32
Duration – 00

Spectral location (cm-1)
1) 2953.39 2)2920 3)2852 4)2358 5)668

Used oil
Name of oil- carding used oil Grade of oil- 32
Duration -3 months

Spectral location (cm-1)
1)2953.66 2)2953.56 3)2920.55 4)2852.34 5)668.62

DISCUSSION

From fig 4.1.1 & 4.1.2 the result of carding oil sample of new and used, shows that the only some changes. The peak observed in both the graph is same, so no any added functional group present in used oil sample. In these graph very small variation in the absorbency, like to say starting phase of degradation. The wavenumber (cm-1) of various chemical group present in carding new oil varies from 668-2953.39 and the wavenumber (cm-1) of various chemical groups present in of carding used oil varies from 668.62-2953.66 which is show the change in concentration of chemical groups present in oil after the use.

4.2 RSB/Comber

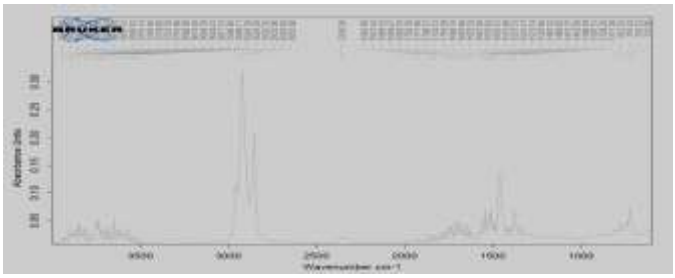


Fig 4.2.1-RSB/Comber Fresh Oil

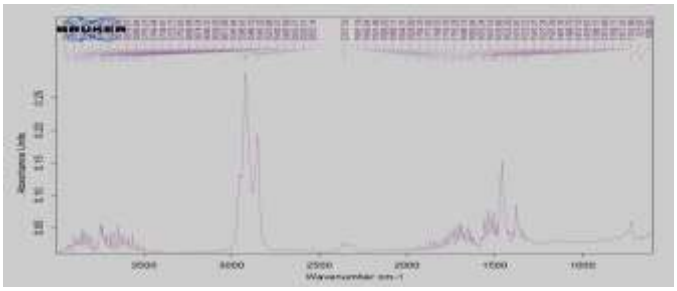


Fig 4.2.2 -RSB/Comber Used Oil 4 Months

Fresh oil
Name of oil- RSB/COMBER fresh oil Grade of oil- 629
Duration – 00

Spectral location (cm-1)
1) 2955.06 2)2920.40 3)2852.00 4) 776.43 5)721.43

Used oil
Name of oil- RSB/COMBER used oil Grade of oil- 629
Duration -4 months

Spectral location (cm-1)
1)2952.27 2)2920.51 3)2852.14 4)743.52 5)721.87

DISCUSSION

From fig 4.2.1 & 4.2.2the result of RSB/Comber oil sample of new and used, shows that the only some changes. It is e shows the spectrum of RSB/Comber oil sample, by comparing Fresh & used spectrum both have common peak but intensity of absorption in Fresh will more. So, same functional group present in used sample oil. Same application area differs the performance because of viscosity of oil.

4.3 SPEEDRAME SPINDLE OIL

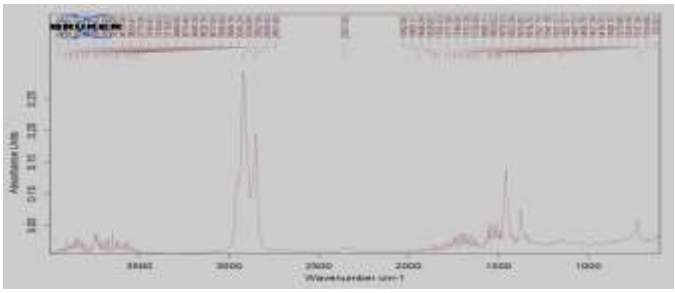


Fig 4.3.1-Speedframe Spindle Fresh Oil

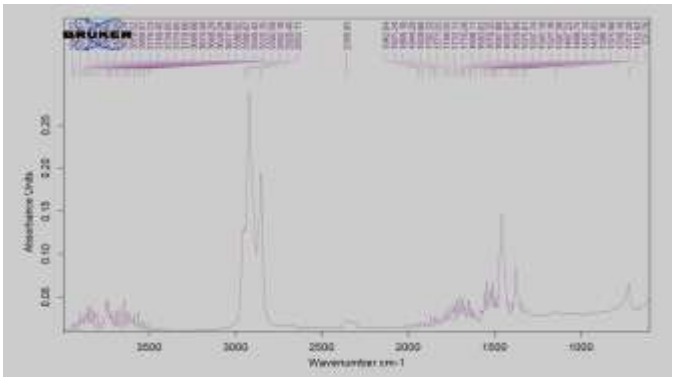


Fig 4.3.2-Speedframe Spindle Used Oil 2 Months

Fresh oil
Name of oil- Speed frame spindle fresh oil Grade of oil- 150
Duration - 00
Spectral location (cm-1)
1) 2920.42. 2)2851.90 3)2357.60 4)1396.16 5)721.78

Used oil
Name of oil- Speed Frame spindle used oil Grade of oil- 150
Duration – 2 months
Spectral location (cm-1)
1)2920.512)2852.11 3)2356.92 4)1396.16 5)721.78

DISCUSSION

From fig 4.3.1 & 4.3.2 the result of speed frame spindle oil sample of new and used, shows that the only some changes. The peak observed in both the graph is same, so no any added functional group present in used oil sample. In these graph very small variation in the absorbency, like to say starting phase of degradation. The wavenumber (cm-1) of various chemical group present in carding new oil varies from 721.78-2920.42 and the wavenumber (cm-1)of various chemical groups present in of carding used oil varies from 721.78-2920.51 which is show the change in concentration of chemical groups present in oil after the use.

4.4RINGFRAME GEAR OIL

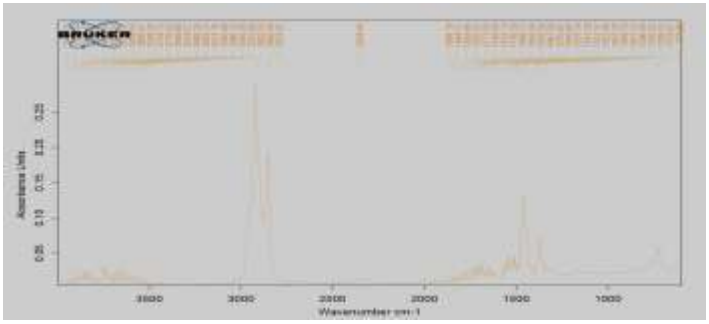


Fig 4.4.1-Ringframe Gear Fresh Oil

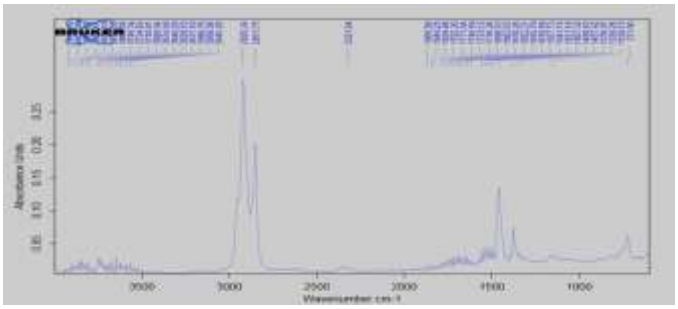


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Fig 4.4.2-Ringframe Gear Used Oil 3 Months

Fresh oil
Name of oil- Ring Frame gear fresh oil Grade of oil- 320
Duration - 00
Spectral location (cm-1)
1) 2920.44. 2)2851.97 3)2354.44 4)1396.09 5)721.60

Used oil
Name of oil- Ring Frame Gear used oil Grade of oil- 320
Duration – 2 months
Spectral location (cm-1)
1)2920.34 2)2851.75 3)2321.54 4)1376.06 5)721.50

DISCUSSION

Figure 4.4.1 and 4.4.2 are shows the spectrum of Ring Frame Gear oil sample, by comparing new & used oil ample of spectrum both have common peak but intensity of absorption in new oil will more. In above Ring Frame addition peak at 2321.54 cm-1 which is a gelatin &sodium hydrogen carbonate mixture. It is nothing but additional additive present in Ring Frame Gear.

4.4 RINGFRAME SPINDLE OIL

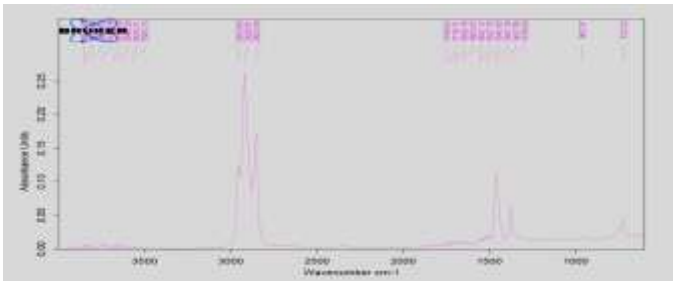

Fig 4.4.1-Ringframe Spindle Fresh Oil

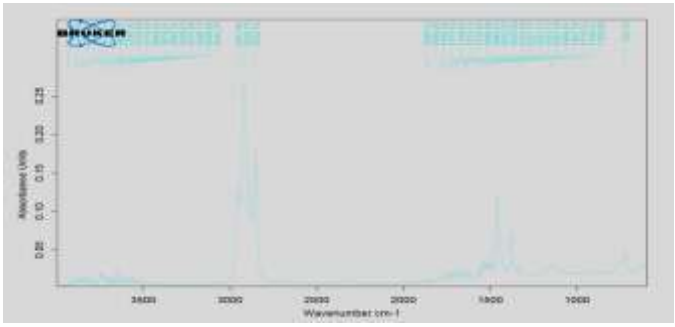

Fig 4.4.2-Ringframe Spindle Used Oil 3 Months

Fresh oil
Name of oil- Ring Frame spindle fresh oil Grade of oil- E10
Duration - 00
Spectral location (cm-1)
1) 2953.68. 2)2920.81 3)2852.60 4)1507.51 5)722.23

Used oil
Name of oil- Ring Frame spindle used oil Grade of oil- E10
Duration – 3 MONTHS
Spectral location (approx. cm-1)
1)2953.64 2)2920.75 3)2852.53 4)1507.38 5)722.16

DISCUSSION

As per above spectrum shows fig 4.4.1 & 4.4.2 that the there is no significant difference between Ring Frame Spindle oil new & used. Peak observed in the spectra have same functional group as previous and more or less same absorption also.

In this graph soot present in the oil is very less at 2000 cm-1, even no increase the percentage of soot in used oil. Water particle found less at 3400 cm-1. Oxidation (carbon) product also observed in oil sample at 1698 cm-1. So, no any chemical change the oil sample. Sample paragraph Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, sc, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

5 CONCLUSIONS

Lubricant oil condition monitoring & life prediction is important for reliability & availability improvement of the textile machinery & reduction of maintenance costs for the industry.

The results shown by the FT-IR spectroscopy shows that chemical properties of the oils sample get changed after the use. As the time period of oil increases its properties get changed. In some cases, new & use oil samples show less correlation & in some cases there are no changes in the properties of oil that means the deterioration in some oil sample is noticeable.

To know about the change in different properties of the oil sample, we have to do the detail analysis of the results. To know more accurate result, we have to do the study of different oil samples at different time period. Detail analysis of the graph regarding the change in the properties of the oil sample is to be done because after the use of lubricating oil, some of its chemical content gets changed and sometime new combination is generated

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