Research on moisture detection method in lubricating oil

Xia Pandeng, Zheng Jinfeng, Fan Xiaoming, Teng Jiangbo, Zou Huiling*

Shandong Product Quality Inspection Research Institute, Shandong Jinan 250100, China

Keywords: Lubricating oil, moisture detection method, research

Abstract: Lubricating oil is one of the important chemical raw materials in the chemical industry. And improving the quality of lubricating oil can guarantee the quality of chemical products in the production of chemical products. However, there will contain a lot of water in general lubricating oil, which will affect the production of chemical industry. Therefore, strengthening the detection of moisture in lubricating oil has become one of the important tasks of chemical companies. This paper briefly analyzes and studies the overview of the presence of moisture in lubricating oils and the methods of detecting moisture in lubricating oils. Moisture testing of lubricants provides valuable references and recommendations to reduce moisture in the lubricant and improve the quality of the lubricant.

1. Introduction

Along with the development and progress of China's economy, the chemical industry has experienced tremendous development. Lubricating oil is one of the important chemical raw materials in the chemical industry, thus strengthening the detection of lubricating oil has become an important part. However, there is always a lot of moisture due to various factors in the production of chemical products, which will affect the production of chemical products in the use of lubricating oil. Therefore, strengthening the detection of moisture in lubricating oil has become the key point. With the help of a variety of ways to detect the moisture in it in the use of lubricating oil, and then find ways to dispose the moisture in the lubricating oil, so as to ensure the quality of lubricating oil, and facilitate the development of the chemical industry.

2. Overview of moisture in lubricating oil

In the chemical industry, lubricating oil is an important chemical raw material. Because of its wide use, it is especially important to ensure the quality of lubricating oil. The moisture in lubricating oil is an significant indicator to measure the degree of lubricating oil pollution. And the moisture detection is more important. Lubricants are common raw materials in the chemical industry and machinery industry. Once the lubricants are contaminated, it will affect the development of the chemical industry and the machinery industry in the following aspects:

First, lubricating oil is an important raw material in the machinery industry. If some mechanical equipment is rusted under long-term operation, affecting the normal use of machinery, then it is necessary to use lubricating oil to improve, thus ensuring the quality of mechanical equipment. However, if the lubricating oil contains a large amount of water, the metal ions on the surface of the mechanical equipment will be in contact with the moisture and air in the lubricating oil, which will accelerate the corrosion of the mechanical equipment, thereby affecting the quality of the mechanical equipment [1].

Second, in the use of lubricating oil, some chemical industries mainly use lubricating oil as a raw material to produce chemical products. However, if the lubricating oil contains a large amount of water, the production of chemical products will be affected. For example, the moisture in the lubricating oil can expand the paper filter element of the lubricating filter, causing the filter hole to clog and reduce the filtration performance, so it is essential to strengthen the detection of moisture in the lubricating oil [2].

Third, in the use of lubricating oil, the moisture in the lubricating oil causes the organic matter in

  DOI: 10.25236/iwass.2018.129

the lubricating oil to contact the oxygen in the air to cause the lubricating oil to oxidize, and once the lubricating oil is oxidized, it will affect the production and mechanical equipment of the chemical industry protection, therefore, in the use of lubricating oil, strengthening the analysis of moisture, and using the detection method to remove the moisture in the lubricating oil is necessary.

3. The moisture detection method of lubricating oil

3.1 Karl Fischer Method

In the moisture detection of lubricating oil, there are many detection methods, among which Karl Fischer method is a common method for detecting moisture of lubricating oil. Karl Fischer method is mainly a chemical detection method, which can accurately determinate moisture in the lubricating oil.It is mainly injected into the aqueous sample by means of the Karlscher reagent in the electrolytic cell, water participates in the redox reaction of iodine and sulfur dioxide, and hydroiodic acid is formed in the presence of pyridine and methanol. Pyridine and methyl pyridine sulfate, the consumed iodine is generated at the anodic electrolysis, so that the redox reaction continues until the water is completely exhausted. This detection method should strengthen the supervision of the detection process during the detection process. In the process of testing, it is necessary to strengthen the supervision of reagents, solvents and equipment. If the stirring speed of the equipment and the solvent do not meet the requirements, it will affect the whole inspection process. This detection method can be quick and simple in the moisture detection of lubricating oil. Master the operation of the program, the detection method in the process of detection is relatively simple and reproducible. Therefore, Karl Fischer method of moisture detection can be widely used, but it is important to improve the efficiency of water testing lubricants [3].

3.2 Distillation Method

Distillation is an important method in lubricating oil moisture detection. In the chemical industry and machinery industry, lubricating oil, as a kind of common materials, it is necessary to strengthen supervision over the quality of the lubricating oil moisture in the process of using lubricating oil. Distillation is one of the important ways of testing. The so-called distillation is a common way in physics, with the aid of some chemical reagents, water and oil in lubricating oils are separated by distillation separation. The water in the lubricating oil is detected by distillation, condensation collection and volume calculation, this is a common way of testing. However, in the process of detection, it is greatly affected by the quality of reagents. If the fraction of anhydrous solvent is not high, the detection effect of lubricating oil will be poor in the process of moisture detection, affecting the quality of detection. Therefore, distillation, as one of the moisture detection methods, should be used with caution [4].

3.3 Resistive pulsed

In the moisture detection of lubricating oil, different detection methods have different advantages and disadvantages. It can be selected according to different actual operating conditions. The electric resistance method is also one of the moisture detecting methods, it will reflect the change of moisture concentration in oil by measuring the change of conductivity of lubricating oil in the moisture detection of lubricating oil. The moisture in the lubricating oil can be measured by observing the change of the concentration of the water. In the moisture detection of the lubricating oil, the moisture content can be visually observed, and the measurement result is more accurate in the measurement process with a larger range. Therefore, in the moisture detection of lubricating oil, the electric resistance method is also a commonly used detection method. However, the detection method using the electric resistance method is affected by contaminants such as metal particles, so the inspection process should be supervised with the help of big data and certain scientific techniques, to reduce the influence of metal particles on the moisture detection process of the lubricant, thereby improving the detection level and quality of the moisture. Therefore, the accuracy of moisture detection can be improved through the resistance method of lubricating oil moisture

detection technology [5].

3.4 Infrared Spectroscopy

With the improvement of China's scientific and technological level, detection technology is gradually strengthened, among which infrared spectroscopy is an important detection method of lubricating oil moisture detection. Infrared spectrometry is a kind of applicable to water content more than zero point one percent of the qualitative and quantitative analysis method, the moisture detection technology is an advanced technology that only need to use infrared and the second can analyze the moisture in the oil in the process of testing. It has no damage, no pollution and convenient in the process of test, and has been regarded as a common measurement methods in the lubricating oil moisture test. However, the method calls for appropriate features peak position and the quantitative calculation method in the process of moisture detection. After detecting the moisture in lubricating oil, the moisture in lubricating oil should be analyzed and studied according to the spectral image data, so as to judge the quality of lubricating oil. Therefore, infrared spectrum detection method can improve the level of detection, but its detection technology is in the initial stage, and more mature research on detection technology is needed [6].

4. Conclusion

To sum up, it is very important to strengthen the detection of water is very important in the quality of the lubricating oil. Therefore, in the lubricating oil moisture detection, based on the experiment of different moisture detection method, for example, Karl Fischer method, distillation, resistance method and infrared spectroscopy, etc., and then compare the different methods of moisture detection, find suitable detection approach, to strengthen the supervision of detection methods, and to ensure its tightness, at the same time, in the process of analysis, standardized operation, overall consideration the influence of the factors , to control the factors influencing the accuracy of the analysis results, so as to ensure the accuracy of the analysis results, and to strengthen the moisture detection level and quality of lubricating oil.

References

[1] Haopeng Gao, Hongwei Yang, Shiliang Yang, et al. Study on the harm of moisture in lubricating oil and its detection [J]. Contemporary Chemical Industry, 2014(2):240-242.

[2] Hongyong Fan, Ping Ouyang, Xianming Zhang, et al. Based on the detection method of moisture in lubricating oil [J]. Application of chemical, 2015(3):554-557.

[3] An Zeng, Cang Chen, Minjie Chen. Determination of moisture content in lubricating oil by infrared spectroscopy [J]. Lubrication and Sealing, 2009, 34(9):102-104.

[4] Wei Yu. Detection Method Based on Moisture in Lubricating Oil [J]. City Construction Theory Research: Electronic Edition, 2015(20).

[5] Siqi Li. Analysis of Moisture Detection Technology in Lubricating Oil [J]. Petrochemical Technology, 2016, 23(12): 77-77.

[6] Jian Yang. Research on the determination of lubricating oil moisture device based on pressure method [D]. Dalian Maritime University, 2015.