

Introduction to Methods for Determining Moisture in Petroleum Products

1. The source of moisture in petroleum products

(1) Water mixed in storage, transportation and use

Moisture mixed into petroleum products during storage, transportation, filling and use for various reasons. If the container is not dry and there is residual moisture, the oil storage container is not tightly sealed or rain, snow and frost fall into the filling process, and the condensation of water vapor can make the petroleum products contain some moisture.

(2) Dissolve moisture in the air

Since petroleum products, especially light fuel oil, have a certain degree of water solubility. With the increase of temperature, the increase of humidity in the air and the increase of aromatic hydrocarbon content, the water solubility of light fuel oil also gradually increases. Gasoline and kerosene are hardly mixed with water, but they are still soluble in no more than 0.01% water.

2. The existence form of water in oil products (1) suspended water

Water is suspended in the oil in the form of fine droplets, forming a cloudy emulsion or latex. This phenomenon mostly occurs in heavy oil with high viscosity, and its protective film can be formed by naphthenic acid, colloidal substances, clay, etc. In this case, the water is difficult to precipitate and separate, and a special dewatering method must be used. For example, aqueous lubricants are often dewatered by agitating the hot oil with air streams or by vacuum drying. Among them, the use of vacuum drying can avoid the oxidation of air.

(2) Dissolve water

Water is evenly dispersed in hydrocarbon molecules in a molecular state, and water in this state is called dissolved water. The solubility of water in the oil depends on the chemical composition and temperature of the oil. In general, alkanes, naphthenes and olefins have a weaker ability to dissolve water, while aromatic hydrocarbons can dissolve more water. The higher the temperature, the more water dissolves in the oil. Generally speaking, the amount of dissolved water of gasoline, kerosene, diesel and some light lubricating oils is very small, and it cannot be detected by the "Petroleum Product Moisture Determination Method" GB/T260-1977 (1988), which is negligible.

(3) Free water

The precipitated tiny water particles aggregate into larger water droplets and precipitate down from the oil, which exists in a state of oil-water separation. In general, the term anhydrous in oil analysis means that there is no free water and suspended water, and it is difficult to remove dissolved water.

3. The hazard of water content in petroleum products

(1) Destroy the low-temperature fluidity of oil

If jet fuel contains water, its freezing point will rise, causing clogging of filters or pipelines, and even interrupting the fuel supply, resulting in accidents. If the vehicle gasoline and vehicle diesel contain moisture, it is easy to freeze in winter and block the fuel oil system. In addition, the water content in the fuel oil will bring inorganic salts into the cylinder, which will cause corrosion, increased carbon deposition and aggravated wear of the parts. The water content of boiler fuel reduces combustion efficiency and increases corrosiveness.

(2) Reduce the antioxidant performance of oil

The aqueous content of petroleum products dissolves newly added antioxidants and accelerates the raw rubber process of oils such as cracked gasoline and other fuels containing unsaturated hydrocarbons. Moisture has a more significant effect on the stability of fuel oil in storage. If there is moisture in gasoline during storage, the rate of gum formation is much greater than when there is no water.

(3) Reduce the solubility of oil

If there is water in the solvent oil, it will reduce the solubility and efficiency of the oil.

(4) Reduce lubrication performance

Lubricating oil with water freezes into ice particles in the winter, clogging oil pipelines and filters, and increasing wear and tear on parts when certain parts of the engine freeze. The presence of moisture also increases the corrosiveness and emulsification of lubricants.

(5) Reduce the dielectric properties of oil

If there is water in the electrical oil, it will reduce its dielectric properties, and in serious cases, it will cause a short circuit and even burn out the equipment.

4. The significance of determining the moisture in oil

Water content is one of the important indicators to evaluate the quality of petroleum products. The determination of oil moisture has the following significance:

Provide a basis for the design of the dewatering process According to the moisture content of the oil, the dewatering method is determined. Evaluate the quality of oil products: moisture is one of the indispensable specifications in various petroleum product standards, and it is also used as the main control index of oil production inlet and outlet materials. Except for water-added fuels that need to be specially treated in order to save energy and protect the environment, water is generally not allowed in petroleum products.

5. Overview of moisture determination methods

Distillation method: A certain amount of sample is mixed with anhydrous solvent, and its moisture content is determined by distillation and expressed as a percentage.

SYD-260A

Link: <https://www.hinotek.com/lab/syd-260a-water-content-tester/>

Reference standard: GB/T260 Petroleum product moisture determination method, GB/T512 grease moisture determination method



Features:

1. The design of the test vessel holder is reasonable, and the installation and disassembly of the condenser tube are convenient.
2. The heating power is continuous and steplessly adjustable, the power is intuitively displayed by the meter, and the temperature control mode is advanced and reasonable.
3. At the same time, two samples can be tested in parallel, and the work efficiency is high.

SYD-8929A

Link: <https://www.hinotek.com/lab/syd-8929a-crude-oil-water-content-tester/>

Reference standard: GB/T8929 Determination of water content in crude oil



Features:

1. This instrument is a desktop structure, which can test 2 samples at the same time.
2. This instrument is heated by electric heating jacket, and the heating power is continuously adjustable, and there is no open flame.
3. At the same time, two samples can be tested in parallel, and the work efficiency is high.

SYD-2122C

Link: <https://www.hinotek.com/lab/syd-2122c-coulometric-karl-fischer-titrator/>

Reference standard: GB/T 11146 Determination of water content of crude oil Karl Fischer coulometric titration

SH/T0246 Methods for the determination of water content in light petroleum products

GB/T 7600

Principle: According to the law of electrolysis, the number of water molecules in the reaction is proportional to the number of charges, and the number of charges (coulombs) in the reaction detected by the instrument is automatically converted into the corresponding number of water molecules. Therefore, this method has high test accuracy, low test cost, high sensitivity, high precision, high reproducibility, low power consumption and energy-saving design. It is widely used in petroleum, chemical industry, electric power, quality inspection, scientific research, environmental protection, energy and other fields.



Features:

1. It can perform micro-analysis of samples with low water content and high sensitivity.
2. Equipped with an imported 0.5ul injector for calibration, the instrument calibration is fast and accurate.

3. It has a test data storage space, which can store more than 20,000 test results, which is convenient for query and retrieval.
4. The unique alternating balance isolation detection technology is adopted to make the detection faster, more accurate and more stable.
5. The electrolytic circuit adopts PWM pulse width adjustment mode, which is advanced in technology and greatly reduces the power consumption of the whole machine.
6. Touch screen human-computer interaction mode is adopted, and the human-computer dialogue interface is cordial, intuitive and friendly.
7. It has a real-time clock (year, month, day, hour, minute, second) display, and has the function of clock power-off hold.
8. Using embedded thermal printer, 36 characters, Chinese character output, printing is quieter, faster and clearer.
9. Convenient I/O technology, using program control, directly input numbers from the interface to adjust the stirring speed.
10. A variety of formula selection, automatic replacement of display units (ug, mg/L, ppm, %) can be memorized.