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Water finding paste and phase finding paste of gasoline fuel: performance comparative study

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Abstract

This research aims to determine the water and phase in the bottom tanks of oil content using water-finding past and phase-finding past. In this work, a comparative performance of three different types of gasoline fuel, which were labeled (Gasoline, G-KK-MWFP, and G-KK-MWFPEG), was determined. Also, the water phase in the gasoline fuel has been determined. The results showed that there is a water level in the gasoline product, whereas there is no phase stage. Hence, the data in this research will help testers and laboratory workers determine the water content and phase in gasoline and other fuel products

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1-Introduction

Water-finding paste is a specialized chemical compound used to detect the presence of water at the bottom of fuel and oil storage tanks. It is a simple yet highly effective tool for maintaining fuel quality, preventing equipment damage, and ensuring operational efficiency across various industries, particularly those involved in petroleum products [1]. The core principle behind water finding paste relies on a distinct color-change reaction upon contact with water. Typically, the paste has a base color (e.g., golden brown or yellow/white), and when it interacts with water, a chemical reaction occurs, changing it to a vibrant, easily discernible color (most commonly bright red or fuchsia, sometimes blue) [2]. This reaction is usually almost immediate, providing quick visual confirmation of water presence. While the exact chemical composition can vary between manufacturers, many pastes use a combination of a carrier base (such as petrolatum and polyethylene glycols for adherence and stability in both oil and water phases) and reactive compounds. Some *formulations* may include calcium oxide to create an alkaline environment that facilitates the color change of an indicator (e.g., thymolphthalein turning blue in the presence of hydroxide ions formed when the paste meets water) [3]. Water finding

paste is widely used across various sectors to ensure fuel integrity and prevent costly issues. Its primary applications include detecting water in gasoline, diesel, kerosene, jet fuel, and other petroleum products stored in tanks, including those at gas stations, fuel depots, industrial reserves, and marine bunkers. Pipelines monitoring for water contamination in fuel pipelines during transportation. Marine vessels crucial for marine and offshore operations to prevent water-related damage to engines and fuel systems [4]. The importance of detecting water in gasoline fuel is a significant contaminant and can lead to a range of several problems, including engine damage where water does not burn like gasoline and can disrupt the combustion process, leading to misfires, rough idling, reduced power, and even engine failure. It can also cause rust and corrosion in fuel system components. Reduced fuel efficiency water in fuel affects the proper fuel-air mixture, leading to decreased fuel economy. Microbial growth water provides an environment for microbial growth (bacteria, fungi, and algae) in fuel tanks, which can clog filters, corrode tanks, and degrade fuel quality. Corrosion water accelerates corrosion of fuel tanks, lines, and engine parts, especially when certain fuel additives or contaminants are present [5]. The presence of water in gasoline, even in small quantities, can have significant negative impacts on vehicles and machinery, leading to customer complaints, operational issues, and financial losses. Water finding pastes are a common and relatively inexpensive tool for initial water detection [6]. However, with various brands and types of water-finding pastes available, along with other potential water-detection methods, a comparative study is valuable for assessing their effectiveness and suitability for the specific operational context of the Salhuldeen branch. The challenge facing this study is that there are few studies similar to this one. This study was also conducted at the Iraqi Ministry of Oil, Petroleum Products Distribution Company, Western Authority, Salahuddin Branch Laboratories (Baiji). The aim of this study was to determine the water content of the gasoline product, to verify the phase examination of the gasoline product, and to compare them. Evaluate the accuracy and sensitivity of different water finding pastes, and compare the ability of various commercially available water finding pastes to accurately detect water in gasoline fuel, particularly in varying concentrations (e.g., small, medium, and large amounts). Assess reaction time and measure the speed at which different pastes exhibit color change upon contact with water, as faster reaction times can improve operational efficiency.

2. Materials and methods

2.1. Gasoline samples

In this study, three different samples of gasoline were tested: the first was free of water, the second contained water, and the third was a two-phase blend of ethanol / gasoline. These samples were named (Gasoline, G-KK-MWFP, and G-KK-MWFPEG) respectively. The testes were done at the Iraqi Ministry of Oil, Petroleum Products Distribution Company, Western Authority, Salahuldeen Branch Laboratories (Baiji). The apparatus that was used in the tests included a 250 ml beaker and a graduated ruler to indicate the water level.

2.2. Water and phase finding paste

In this study, two types of pastes were used: the phase test paste and the water test paste. This type has a product code (KK-MWFP), and this code means (Kolor Kut Modified Water Finding Paste). While the phase test paste type has a product code (KK-MWFPEG), this code means (Kolor Kut Modified Water Finding Paste for ethanol/gasoline), to detect the water content and find the phase in the gasoline product.

2.3. Methodology

Laboratory tests were conducted, including specific gravity (Sp. gr.), American Petroleum Institute (API) degree, and distillation testing, for the three gasoline products. The water content and phase were tested (ASTM D 1298) [7], (ASTM D-4052) [8], (ASTM D86) [9], respectively.

3. Results and discussions

3.1. Gasoline specifications

The physical properties of gasoline fuel products as shown in Table 1. The results showed that the gasoline specifications remained unchanged and were within the permissible range. The effect of water content on the results was studied only [1]. Since water does not mix with petroleum products, the specifications of gasoline fuel were not affected. In the laboratory, it was also shown that water was less dense than petroleum products, leading to water stagnating at the bottom while the higher-density gasoline floated [4].

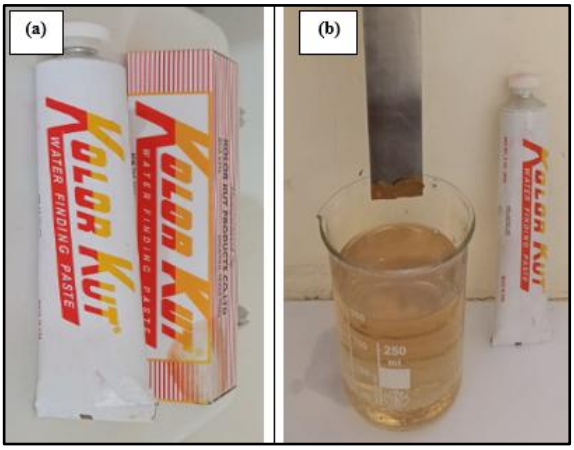

Figure 1: KK-MWFP, (a) water finding past, (b) gasoline content of water

Table 1: Specifications of gasoline, G-KK-MWFP, and G-KK-MWFPEG

Tests	Gasoline	G-KK-MWFP	G-KK-MWFPEG
Density	745.1	746.2	744.9
Sp. gr	0.745.1	0.7462	0.7449
API	58.4	58.1	58.6
Distillation			
I.B.P °C	60	61	61
Volume 5 % °C	76	79	75
Volume 10 % °C	86	88	84
Volume 20 % °C	94	100	99
Volume 30 % °C	120	125	114
Volume 40 % °C	131	130	124
Volume 50 % °C	139	140	134
Volume 60 % °C	149	150	151
Volume 70 % °C	169	166	164
Volume 80 % °C	180	185	181
Volume 90 % °C	188	191	189
Volume 95 % °C	199	200	198
E.B.P °C	205	213	206
T.D volume % ml	98	98	98
Res volume % ml	1.5	1.5	1.5
Loss volume % ml	0.5	0.5	0.5

3.2Water finding paste

Figure 1 shows that the water finding paste was used to gauge water content in methanol/ethanol enriched fuel stage/oil products. As a result, It turned out that the color had changed from yellow to brown, indicating the presence of water with the gasoline product. This indicates the juicer's effectiveness at detecting water. The amount of water was calculated according to the level of color change on the ruler [10]. Figure 1a shows the type of finding past that was used to detect water (water finding past), while Figure 1b shows the gasoline sample, which contains a percentage of water at the bottom.

3.3.Phase finding paste (for ethanol/gasoline blends)

Figure 2 shows the water finding paste (for ethanol/gasoline blends), as a result it was found when the gasoline contents the water, the color changed from dark brown to red. For testing for the presence of miscible water in bio-ethanol / gasoline blends. Suitable only for use with fuel type reformulated and oxygenated fuels, such as ethanol, methyl tert-butyl ether (MTBE), and ether [11]. Figure 2a shows the type of finding past that was used to detect water (for ethanol/gasoline blends), while Figure 2b shows the gasoline sample, which contains a percentage of water at the bottom.

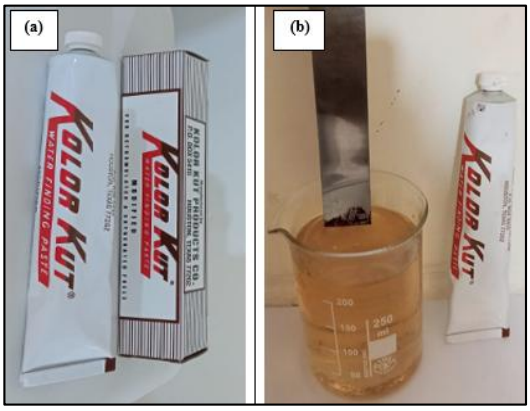

Figure 2: KK-MWFPEG, (a) phase finding past, (b) gasoline content of water

4. Conclusion

In this study, the performance of the water-testing juicer and the phase-testing juicer was successfully evaluated. It was shown that the water-testing juicer has rapid, accurate detection capability due to the presence of hydroxide ions and their strong interaction with the juicer. As for the phase-detection juicer, it was shown that its performance is not essential because phase cannot be easily detected. Water finding paste (for ethanol/gasoline blends) was suitable only for use with fuel type reformulated and oxygenated fuels, such as ethanol, MTBE, and ether.

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References

1. Mohammed A E, Aabid A A, Mohammed A E, Humadi H I. Process Model Development and Optimal Kinetics for Fuel Desulfurization via a Novel Nano-Catalyst," Iran. J Chem Chem Eng. 2024;43(11):3904-3917 doi.10.30492/ijcce.2024.2027346.6567.

2. Alwaise AM *et al.*, "The effect of physical properties of lost petroleum quantities in vertical tanks at (NRC) Baiji. *Energy Explor. Exploit.*

2023;24(2): 01445987231220961https://doi.org/10. 1177/ 01445987231220961
3.Singh V, Chakravarthi MH, and Srivastava VC. Chemically modified biochar derived from effluent treatment plant sludge of a distillery for the removal of an emerging pollutant, tetracycline, from aqueous solution. 2021;11(6) doi: 10.1007/s13399-020-00683-4.
4. Humadi J I, Mohammed A E, Khamees L A, Jafar S A, and M A Abdulqader. Oil upgrading via desulfurization process using a new composite nano-alkaline-iron oxide over titanium oxide catalysts," *Energy Environ.* 2025; 1-29 doi:10.1177/0958305X251344235
5. Humadi J I, Aabid A A, Mohammed A E, Ahmed G S, and Abdulqader M A. New Design of Eco-Friendly Catalytic Electro-Photo Desulfurization Process for Real Diesel Fuel. *Chem Eng Res Des.* 2024;206:285-301.https://doi. org/10.1016/ j.cherd. 2024. 05.001.
6.Ibrahim M M , Abdulqader M A, and Alabdraba W M S. Physicochemical property of hydrochar produced by hydrothermal carbonization of waste oily sludge," in *AIP Conference Proceedings*, AIP Publishing, 2024.
7. Novandy A. Evaluasi Uji Density Metode Astmd 1298 dan D 6822," *Swara Patra*,. 2019; 9(1):1–6. https://ejurnal.ppsdmmigas. esdm.go. id/sp/index.php/swarapatra/article/view/192
8, Banurea R , Frida E, Rahwanto A, Nasution D L S, and Simbolon T R. Design a machine with technology to convert plastic waste into fuel renewable energy. Journal of Physics*: Conference Series*, IOP Publishing, 2024: pp:12004.
9. Al-Rubaye A H, Al-Robai H A, Jasim D J, Al-Khafaj H A M, H F Ameen, and Al-Turaihi A S. Environmental Method of Distilling Gasoline Based on ASTM D86: A Comparative Study," in *IOP Conference Series: Earth and Environmental Science*, IOP Publishing, 2024, p. 22021.
10. Al-Rubaye A H, Al-Robai H A, Jasim D H, Al-Khafaj H A M, Ameen H F, and -Turaihi A S. "Environmental Method of Distilling Gasoline Based on ASTM D86: A Comparative Study," in *IOP Conference Series:* Earth and Environmental Science, IOP Publishing, 2024, pp: 22021.
11. Mohammed A E and Al-jubouri H M S. Total remediation of North Refineries Company oily sludge using hydrothermal carbonization for hydrochar production".onference: 2023 International Conference on Engineering, Science and Advanced Technology (ICESAT). doi:10.1109/ ICESAT58213.2023.10347311

معجون تحديد الماء ومعجون تحديد الطور لوقود الكازولين: دراسة مقارنة الادء

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الخلاصة:

يهدف هذا البحث إلى تحديد مستوى الماء وتحديد مستوى الطور في قعور خزانات منتوج الكازولين باستخدام عجينة كشف مستوى الماء وعجينة كشف الطور. في هذا العمل، تم تحديد الأداء المقارن لثلاثة أنواع مختلفة من وقود البنزين والتي تم تسميتها (الكيروسين- كيروسين كاشف المياه- كيروسين كاشف الطور). وايجاد مستوى الماء في مُنتج وقود البنزين وكشف اختلاف الاطوار. أظهرت النتائج وجود مستوى ماء في مُنتج البنزين، وعدم وجود طور. لذا، ستساعد بيانات هذا البحث المُختبرين والعاملين في المختبرات على تحديد مستوى الماء والطور في مُنتجات قود الكازولين والمنتجات النفطية.