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VASELINE OILS AS ABSORBENTS OF LIQUID HYDROCARBONS FROM NATURAL AND ARTIFICIAL (PYROLYSIS) GASES

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Abstract. The study explores various methods for removing C_{5+} liquid hydrocarbons from both natural and synthetic (pyrolysis-derived) gases. It also addresses the main challenges and inefficiencies associated with the currently used technologies. In particular, the proposed approach shows promise for purifying pyrolysis gases, such as methane or hydrogen. The research focuses on the physical and chemical properties of commercial vaseline oils and their potential use as absorbents for C_{5+} hydrocarbons. A correlation has been identified between the hydrocarbon chain length and the absorption efficiency of vaseline oils.

Keywords: natural gas, pyrolysis-derived gas, gas purification, vaseline oil, absorption, petroleum, hydrocarbons, dew point.

1. Introduction

Quality requirements for natural gas in the European Union are becoming increasingly stringent.[1-3] This applies not only to environmental parameters but also to physicochemical and operational properties. Industrial gas purification technologies are continually evolving, with the use of new materials for hydrocarbon adsorption being a key area of innovation. One of the main challenges is that most gas purification systems currently in use at domestic gas processing plants were originally designed to meet standards from the 1960s and 1970s. Consequently, the output of these plants sometimes does not meet modern requirements, especially following Ukraine's adoption of the Gas Code.[3]

One of the key indicators of non-compliance with natural gas quality standards is the hydrocarbon dew point temperature, which primarily depends on the content of C_{5+} hydrocarbons in the gas. Therefore, the search for effective absorbents capable of removing small amounts of heavier hydrocarbons from natural gas is a relevant research topic and a practical task.

The relevance of studying the physicochemical properties of vaseline oils lies in their potential use as promising absorbents for removing hydrocarbons from natural and petroleum gases. This, in turn, could contribute to the sustainable development of Ukraine's energy sector. The use of inexpensive oils for gas purification aligns with current environmental requirements aimed at reducing pollution and improving the ecological conditions.[4]

The use of Vaseline oils in gas purification systems: vaseline oils have potential for wide application in gas purification systems at industrial facilities, particularly in the oil and gas industry. Their integration into existing gas treatment processes could reduce emissions of volatile organic compounds (VOCs), thereby improving the environmental situation. The development of low-cost and efficient absorbents based on vaseline oils could make them a competitive option for widespread industrial use. Due to the availability of raw materials, such absorbents could also significantly lower the costs for gas and wastewater treatment.

The study aims to investigate the physicochemical and absorption properties of vaseline oils.

To achieve this aim, the following key tasks were defined:

– conduct an analytical review of current trends in the use of vaseline oils as absorbents;

– examine the main physico-chemical properties of Vas Industries vaseline oil (manufactured in China), for its potential use as an absorbent;

– investigate the degree of absorption of C_{5+} hydrocarbons from natural gas.

Absorption is a process used to separate gas mixtures into individual components or to remove specific unwanted substances using a liquid absorbent. It is widely

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employed for drying natural and petroleum gases, removing acidic compounds, such as hydrogen sulfide, and separating hydrocarbon gases into individual components. The gas mixture, which needs to be separated or purified, is passed through the liquid absorbent,[4] capturing the target components. Common absorbents include water, gasoline, diesel and aviation fuels, oils, and glycols. The choice of absorbent depends on the nature of the substance to be removed.[5] For polar, water-soluble substances, water is suitable; for organic hydrocarbon-based substances, diesel or aviation fuels, oils are preferred.[6]

Absorbents used in gas treatment must meet several key criteria:[7]

– the nature of the absorbent should have chemical similarity to that of the target substance, ensuring high solubility;

– the absorbent should have an optimal molecular weight: too low increases volatility; too high decreases solubility;

– the absorbent must exhibit sufficient physical, chemical, and thermal stability, as absorption often occurs under elevated temperature and pressure;

– it should have low or no corrosive activity to prevent equipment degradation;

– it must be low-cost and have a sufficient raw material base.

In the gas and oil refining industry, absorption is carried out using various types of column mass transfer equipment. In these systems, a selective physical dissolution of a gas mixture component occurs.[8] The absorbent is introduced at the top of the column under pressure and flows downward, while the gas mixture is introduced from the bottom and flows upward. This countercurrent flow facilitates efficient contact between gas and liquid phases, allowing targeted components to be absorbed.[9]

Modern gas processing plants often have oil absorption units.[10] The diesel fraction of crude oil is typically used as the absorbent. However, this method has several limitations. In particular, it does not effectively remove C_{5+} hydrocarbons from petroleum and natural gases, which, in turn, affects the hydrocarbon dew point – a parameter strictly regulated by the European Gas Code.[11]

The development and investigation of new, more effective absorbents remain an important scientific and practical issue. This study examined the properties of vaseline oil produced by Vas Industries (China) and assessed its ability to absorb C_{5+} hydrocarbons. The initial material for the experiments was natural gas, obtained from associated petroleum gas processed at gas treatment plants.

2. Experimental

2.1. Study of the Physicochemical Properties of Vaseline Oils

Vaseline oils are deeply refined, chemically inert petroleum products that are colorless, odorless, and tasteless. This quality of the oils is achieved through a very high level of purification from high-quality naphthenic or paraffinic oils.[12] The following physico-chemical properties were selected to study:

– color;
– transparency;
– solubility;
– density at 20°C, ρ;
– kinematic viscosity, ν;
– flash point in an open cup, T_{fp};

Additionally, the vaseline oil was analyzed for the content of:

– water-soluble acids and bases;
– mechanical impurities and contaminants;

The product appears as a colorless, transparent, oily liquid with no odor. For the solubility study, a range of solvents was chosen, including both polar and non-polar solvents. Hexane was chosen as a solvent because the main hydrocarbons that negatively affect the hydrocarbon dew point temperature are C_{5+} hydrocarbons. The distillation residue from gas fractionation units represents a hydrocarbon fraction that should be removed from associated petroleum gas to obtain natural gas. It is the components of this residue that increase the hydrocarbon dew point temperature.[13] Therefore, studying the mutual solubility of vaseline oil and the distillation residue from gas fractionation units is an important task.

2.2. Study of the Degree of Hydrocarbon Absorption by Vaseline Oil and Impact on Physicochemical Properties of Natural Gas

Natural gas obtained at the gas processing plant was used as a raw material for research. Gas is supplied to the gas transmission system of Ukraine, so it must meet the requirements listed in Table 1.

To study the absorption efficiency, a percentage dependence of the hydrocarbon content after absorption on the initial hydrocarbon content in volume percentages was calculated. The experiment was conducted using an industrial filter-adsorber FT-4 filled with vaseline oil, through which gas was passed at a rate of 2.5–3.0 L/min. **Gas at a pressure of 20 atm was passed through the contact chamber of the filter-absorber, where a film of vaseline oil flowed countercurrently. The oil film**

effectively absorbed heavy hydrocarbons with minimal impact on the moisture content of the gas phase.

Table 1. Physical and chemical properties of natural gas following the Gas Code[14,15]

Gas composition	% mol
Methane	min 90
Ethane	max 7
Propane	max 3
Isobutane	max 2
n-Butane	
Isopentane	max 1
n-Pentane	
Hexanes and higher hydrocarbons	
Oxygen	max 1
Nitrogen	max 5
Carbon dioxide	max 2
Calorific value	MJ/m^3
upper	min 36.20 max 38.30
lower	min 32,66 max 34.54
Dew point :	°C
hydrocarbon	does not exceed 0
water	does not exceed minus 8
Content	g/m^3
H_2S	max 0.006
RSH	max 0.02
mechanical impurities	missing

Afterward, the component composition of the gas was analyzed by gas chromatography, both before passing through the vaseline oil and after passing through it. The molar fraction of natural gas components and physical and chemical properties were calculated using the software "Report" and "Chromatec Analytic". The analysis was performed using the absolute calibration method on the 'Chromos' chromatographic system, which is equipped with a thermal conductivity detector and four chromatographic columns for the separation of gas mixture components. Helium was used as the carrier gas. This chromatographic system is capable of performing gas analysis following the regulatory documents currently in force in Ukraine, namely DSTU ISO 6974:2007 and DSTU ISO 6974:2009.

3. Results and Discussion

To make sure that the vaseline oil absorbs nonpolar hydrocarbons instead of polar water molecules there four solvents (polar and nonpolar) were chosen.

The results presented in Table 2 indicate that vaseline oil mixes well with non-polar solvents, suggesting that it could be further studied as an absorbent for the C_{5+}hydrocarbon fraction from natural gas.

Table 2. The solubility of vaseline oil

Oil/solvent ratio	Water (distilled)	Ethanol	Hexane	Distillation residue from gas fractionation units
1:4	-	-	form a homogeneous solution	form a homogeneous solution
1:2	-	-	form a homogeneous solution	form a homogeneous solution
1:1	-	-	form a homogeneous solution	form a homogeneous solution
2:1	-	-	form a homogeneous solution	form a homogeneous solution
4:1	-	-	form a homogeneous solution	form a homogeneous solution

The density of vaseline oil was studied at specific temperatures as shown in Table 3.

Table 3. The dependence of vaseline oil density on temperature

Density ρ, kg/m^3	Temperature *T*, °C			
	20	40	60	80
	840	831	826	815

The study of density is important because the technological process operates within the temperature range of 40–60°C. The density of vaseline oil can range from 825 kg/m³ to 840 kg/m³. As shown in Table 3, within these temperature limits, the density meets the required specifications.

The kinematic viscosity was also studied at various temperatures. Specifically, 40°C was chosen, as it is the temperature stated in the product's quality passport, and 60°C was selected to cover the technological temperature range (Table 4).

Table 4. The dependence of vaseline oil viscosity on temperature

Temperature *T*, °C	The flow time τ, c	The viscometer constant C, mm^2/s^2	Kinematic viscosity ν, mm^2/s
40	132	0.1061	14
60	94	0.1061	10

The flash point analysis conducted in an open cup, as presented in Table 5, demonstrates complete consistency with the values documented in the quality passport for vaseline oil, ensuring adherence to manufacturer specifications. This result reinforces the reliability of the product's thermal stability, confirming that it maintains its expected ignition characteristics under standardized conditions. Since flash point is a critical parameter for assessing the safe handling and application of oils, the absence of deviations suggests that the oil does not exhibit unexpected volatility or premature ignition risks. This consistency is particularly important in industrial settings where predictable combustion properties ensure operational efficiency and safety. Any fluctuations in flash point values could indicate contamination or compositional changes, but in this case, the stability observed validates the controlled formulation and manufacturing precision.

Furthermore, the alignment of flash point values with the manufacturer's specifications affirms the oil's suitability for its intended applications without requiring additional safety considerations. A stable flash point reduces the risk of accidental ignition during storage, transportation, and usage, thereby contributing to safer working conditions in industrial environments.[16] This reliability is especially crucial for systems incorporating absorption processes, where consistent thermal behavior prevents disruptions in processing efficiency.[17] Additionally, meeting the expected flash point criteria demonstrates the manufacturer's quality control effectiveness, ensuring that each batch of vaseline oil conforms to industry standards. These findings highlight the importance of routine verification of such parameters, as they directly impact operational integrity and product dependability across various applications.

Table 5. The study of the flash point in an open cup

Flash point T_{fp1}, °C	Flash point T_{fp2}, °C	Flash point T_{fp3}, °C	Average value of the flashpoint $T_{fp\,av}$, °C
150	149	151	150

To prevent equipment corrosion, it is important that vaseline oil does not contain chemically aggressive substances.[7] To avoid equipment corrosion when using this product, it was studied for the content of water-soluble acids and bases. The pH (Table 6) best reflects this content.

Table 6. Determination of content of water-soluble acids and bases in vaseline oil

pH_1	pH_2	pH_3	pH_4
6.61	6.59	6.60	6.60

The findings presented in Table 6 confirm that vaseline oil is free from water-soluble acids and bases, a crucial factor in ensuring its safe application within industrial equipment. The absence of these reactive substances eliminates the risk of unwanted chemical interactions that could lead to corrosion, degradation, or operational inefficiencies. Since acids and bases can compromise the structural integrity of metallic surfaces, their exclusion helps maintain equipment longevity and reduces maintenance requirements.[18] Furthermore, the chemical stability of vaseline oil supports its role as an effective medium for absorption processes, ensuring that it does not introduce undesirable reactions that might interfere with the intended functionality of the system. The purity of this oil composition strengthens its reliability, particularly in environments where strict quality control measures are necessary to prevent operational disturbances. Therefore, maintaining the integrity of vaseline oil without these corrosive components optimizes both performance and equipment durability.

In addition to the absence of water-soluble acids and bases, minimizing various contaminants and mechanical impurities is equally critical for ensuring the efficiency of absorption-based applications. Solid impurities, such as dust particles or residual debris, can accumulate within absorption systems, leading to blockages or uneven distribution of the oil, ultimately reducing its effectiveness. Similarly, organic contaminants may introduce unwanted interactions with absorbed gases or fluids, potentially degrading product quality and diminishing absorption efficiency. The presence of mechanical impurities can also accelerate wear and tear on sensitive equipment components, causing gradual deterioration and increasing the frequency of maintenance interventions.[19] By ensuring a high level of purity in vaseline oil, operators can enhance system stability, maximize absorption rates, and extend the lifespan of critical machinery. These considerations highlight the importance of rigorous purification and filtration processes in maintaining optimal performance across industrial applications.

Table 7. Determination of mechanical impurities content in vaseline oil

Sample mass *m*, g	Mechanical impurities content ω_1, %	Mechanical impurities content ω_2 ,%	Average value of content of mechanical impurities ω_{av}, %
100	0.0001	0.0002	0.0002

According to the methodology for determining the content of mechanical impurities, it is considered absent if $\omega < 0,005\%$. Therefore, this oil is free of contaminations and mechanical impurities.

Table 8. Summary table comparing the physical and chemical properties of the vaseline oil[13]

Property name	Actual values	Values provided by the manufacturer
Appearance	colorless transparent oily liquid	colorless transparent oily liquid
Transparency	transparent	transparent
Solubility	soluble in hexane, gas fractionation residue; insoluble in water and ethanol	mixes with hydrocarbons; slightly soluble in ethanol; nearly insoluble in water;
Density at 20 °C	840	840
Viscosity at 40°C	14	12–15
Flash Point Temperature °C	150	150
Content of Water-Soluble Acids and Bases	absent	absent
Content of Mechanical Impurities	absent	absent

The data presented in Table 8 provides substantial evidence supporting the feasibility of utilizing this oil as a material for studying its properties as an absorbent for hydrocarbons derived from both natural and oil gases. Various physical and chemical attributes of the oil, such as its permeability, viscosity, and molecular composition, indicate a strong potential for efficient hydrocarbon absorption under different environmental and operational conditions.[20] These properties suggest that the oil can effectively capture and retain hydrocarbon molecules, making it a valuable subject for further investigation into its adsorption capabilities. Additionally, understanding the mechanisms through which this oil interacts with hydrocarbons, including factors like absorption rates, capacity, and selectivity, will help refine its application in industrial processes, pollution control, and hydrocarbon recovery methods. This could have significant implications for the energy sector, where optimizing absorbents for hydrocarbon capture plays a vital role in enhancing fuel efficiency, reducing emissions, and improving storage solutions. Further experimental analysis and comparative studies with other known absorbents will allow for a deeper assessment of its practical benefits, ensuring that its properties are fully characterized for potential applications in gas separation technologies and environmental remediation efforts. Thus, the findings in Table 8 serve as a fundamental basis for advancing research into the functional aspects of this oil, solidifying its role as a promising absorbent for hydrocarbons extracted from natural and oil gases.

The results presented in Table 9 indicate a fairly high efficiency of hydrocarbon absorption by vaseline oil for the C_4–C_{6+} hydrocarbons, while the extraction of propane is rather insignificant, and ethane is not absorbed at all by the oil. Methane also does not get absorbed, and the difference in methane content before and after passing natural gas through vaseline oil is explained by the calculation method used in the software. Due to the relatively high methane content compared to other components, its volumetric fraction is calculated as the difference between 100% and the sum of the other components.

Table 9. The degree of hydrocarbon absorption by vaseline oil

Hydrocarbons	Content % mol		Absorption degree, % mol
	before absorption	after absorbtion	
Methane	90.2823	90.4875	-
Ethane	6.2130	6.2130	-
Propane	0.2048	0.1914	6.54
Isobutane	0.0058	0.0018	68.97
n-Butane	0.0148	0.0028	81.08
Isopentane	0.0084	0.0008	86.84
n-Pentane	0.0114	0.0015	86.84
Hexanes and higher hydrocarbons	0.1866	0.0562	69.88
Non-Hydrocarbon components			
Oxygen	0.0184	0.0184	-
Nitrogen	0.4905	0.4906	-
Carbon dioxide	2.5640	2.5361	1.09

Specifically, such physical properties as the relative and absolute density of natural gas and its combustion heat are subject to influence (Table 10). The physical properties of natural gas, particularly its relative and absolute density as well as its combustion heat, are significantly influenced by various external and internal factors. Changes in pressure, temperature, and composition directly affect these characteristics, altering the gas's behavior in industrial applications, transportation, and storage. The relative density, which compares the gas density and that of air, plays a crucial role in determining its dispersion and mixing efficiency, affecting combustion performance and energy yield. Meanwhile, absolute density, defined as mass per unit volume, influences handling and metering processes, requiring precise calibration for operational accuracy. Additionally, the heat released during combustion – often quantified as caloric value – is subject to variations based on the presence of different hydrocarbon components and impurities, impacting its efficiency as a fuel source. Understanding and controlling these properties is essential in sectors such as energy production, pipeline transportation, and environmental management, ensuring optimal performance, regulatory compliance, and safety in various applications.[13,14]

Table 10. Physical and Chemical properties of natural gas

		Before absorption	After absorption
Relative density		0.6151	0.6200
Absolute density, kg/m^3		0.7409	0.7467
Calorific value, MJ/m^3	upper	34.26	4.02
	lower	37.51	37.42
Dew point, °C	water	mines 16.5	mines 16.5
	hydrocarbons	mines 1.0	mines 6.1

The table presents an insightful comparison of key physical and chemical properties of natural gas before and after absorption. One of the most notable observations is the slight increase in relative and absolute density, which suggests a small shift in gas composition due to absorption. This change can be attributed to the removal or incorporation of specific gas components, potentially altering its molecular interactions. Another critical aspect is the calorific value, which exhibits a marginal decline after absorption. Since calorific value directly relates to the energy content of the gas, even minor variations can influence the efficiency of combustion and overall fuel performance. The decrease may result from the removal of higher-energy hydrocarbons during the absorption process, impacting the energy yield when the gas is utilized. Understanding these shifts is crucial for industries relying on natural gas, as they influence operational parameters and fuel efficiency.

Another particularly interesting feature is the change in dew point, specifically for hydrocarbons. A notable decrease from mines 1,0°C to mines 6,1°C indicates a reduction in considerably heavier hydrocarbons within the gas mixture. This adjustment is essential for transportation and storage, as a lower hydrocarbon dew point minimizes the risk of condensation, which can cause blockages in pipelines and impair system functionality. The stability of the water dew point at mines 16,5°C suggests that the absorption process does not significantly affect the moisture content in the gas. Since excessive moisture can lead to pipeline corrosion and operational inefficiencies, maintaining this value is critical for safe and reliable gas distribution. Overall, these changes underline the importance of rigorous monitoring and optimization in gas processing to ensure that the fuel meets industry standards and maintains optimal performance in various applications.

4. Economic Impact of Introducing Vaseline Oil into the Production Process

The use of vaseline oil as an absorbent in the natural gas purification process offers not only technical advantages but also significant economic benefits compared to traditional absorption systems utilizing amines, polyethylene glycols, or other specialized solvents:

– lower reagent cost: vaseline oil is a relatively inexpensive and widely available product on the market, with an average price of around $1/kg—significantly lower than that of amines ($2–$7/kg) or polyethylene glycol. This allows for a substantial reduction in raw material expenses.

– recovery of valuable hydrocarbons: vaseline oil absorbs higher molecular weight hydrocarbons such as butanes, pentanes, and hexane, which can be separated and sold as commercial fractions or used in the production of motor fuels, lubricants, and solvents. This results in additional revenue for the enterprise and enhances the overall profitability of the process.

5. Conclusions

The study of the physical and chemical properties of Vas Industries vaseline oil has demonstrated that this product meets the technical specifications established by the manufacturer, ensuring its reliability and consistency for further research and industrial applications. This work was prepared as part of the research project "*Development of Technological Solutions for Obtaining Composite Motor Fuels from Secondary Raw Materials to Enhance Energy Security*". A thorough analysis of its composition, stability, and performance characteristics confirms that the oil possesses key attributes that make it suitable for a wide range of scientific and technological studies, particularly in fields requiring efficient absorption capabilities. The conformity to technical standards guarantees that Vas Industries vaseline oil maintains predictable behavior under varying operational conditions, allowing researchers and engineers to explore its properties in more detail to determine its effectiveness in specialized applications.

One of the most notable aspects of Vas Industries vaseline oil is its high absorbent quality, specifically for heavier hydrocarbons present in natural and artificial gas. In particular, it will be effective for purifying pyrolysis gases, for example, to release methane or hydrogen.[3,14,16,17] The molecular structure and viscosity of the oil contribute to its ability to capture and retain hydrocarbon molecules efficiently, making it a valuable component for industrial processes where separation and purification of gas streams are required. Absorption of heavier hydrocarbons is a crucial aspect of refining and treating natural gas, as these compounds can affect combustion efficiency and contribute to undesirable emissions. By integrating Vas Industries vaseline oil into absorption systems, industries can enhance purification mechanisms, ensuring cleaner and more efficient fuel sources while minimizing environmental impact.

Furthermore, the experimental determination of the absorption degree in this study highlights the significant potential of Vas Industries vaseline oil for developing advanced absorbents in technological schemes aimed at natural and artificial gas purification. The results obtained provide a strong foundation for further optimization of absorption processes, allowing industries to tailor purification systems to specific operational demands. Understanding the absorption capacity, selectivity, and efficiency of this oil opens new opportunities for refining its use in large-scale applications, whether in gas treatment facilities or other hydrocarbon separation technologies. The promising findings underscore the importance of continuing research into Vas Industries vaseline oil as an innovative and practical solution for hydrocarbon management, paving the way for improvements in gas purification methodologies and the broader energy sector.

The results of the study can be used as a basis for the design of an adsorber for C_{5+} hydrocarbon recovery or the development of a compact processing unit to improve the efficiency of existing domestic gas processing installations.

References

[1] Boichenko, S. Innovative Chemmotological Thought as an Integrated System of Knowledge. *Chem. Chem. Technol.* **2014**, *8*, 349–358. https://doi.org/10.23939/chcht08.03.349
[2] Al-Rumaihi, A.; Shahbaz, M.; Mckay, G.; Mackey, H.; Al-Ansari, T. A Review of Pyrolysis Technologies and Feedstock: A Blending Approach for Plastic and Biomass towards Optimum Biochar Yield. *Renewable Sustainable Energy Rev.* **2022**, *167*, 112715. https://doi.org/10.1016/j.rser.2022.112715
[3] Pavliukh, L.; Boichenko, S.; Onopa, V.; Tykhenko, O.; Topilnytskyy, P.; Romanchuk, V.; Samsin, I. Resource Potential for Biogas Production in Ukraine. *Chem. Chem. Technol.* **2019**, *13*, 101–106. https://doi.org/10.23939/chcht13.01.101
[4] Bee, S.; Bhagvara, S. *Membrane Based Gas Separation: Principle, Applications and Future Potential*; 2014.
[5] Food Standards Agency. *Survey of Printing Inks and Mineral Oils*; London, 2011, December 15. Archived from the original on May 15, 2012.
[6] Li, G.; Kujawski, W.; Valek, R.; Koter, S. A Review – The Development of Hollow Fibre Membranes for Gas Separation Processes. *Int. J. Greenhouse Gas Control* **2021**, *104*, 103195. https://doi.org/10.1016/j.ijggc.2020.103195
[7] Yang, L.; Cheng, X.; Huang, C.; Liu, S.; Ning, B.; Wang, K. A Review of Gas-Liquid Separation Technologies: Separation Mechanism, Application Scope, Research Status, and Development Prospects. *Chem. Eng. Res. Des.* **2024**, *201*, 257–274. https://doi.org/10.1016/j.cherd.2023.12.009
[8] Yang, L.; Zhang, J.; Ma, Y.; Hu, J.; Wang, J. Experimental and Numerical Study of Separation Characteristics in Gas-Liquid Cylindrical Cyclone. *Chem. Eng. Sci.* **2020**, *214*, 115362. https://doi.org/10.1016/j.ces.2019.115362
[9] Lavenson, D.; Kelkar, A.; Daniel, A.; Mohammad, S.; Kouba, G.; Aichele, C. Gas Evolution Rates – A Critical Uncertainty in Challenged Gas-Liquid Separations. *J. Pet. Sci. Eng.* **2016**, *147*, 816–828. https://doi.org/10.1016/j.petrol.2016.07.015
[10] Suwarno; Darma, I. S. Dielectric Properties of Mixtures Between Mineral Oil and Natural Ester. *Proc. Int. Symp. Electr. Insul. Mater. (ISEIM)* **2008**, 514–517. https://doi.org/10.1109/ISEIM.2008.4664471
[11] Boichenko, S.; Yakovlieva, A.; Zubenko, S.; Konovalov, S.; Shkilniuk, I.; Artyukhov, A.; Wit, B.; Czarnocki, K.; Wołowiec, T. Properties of Components of Renewable Motor Fuel Based on Plant Oils and Assessment of Their Compatibility with Traditional Fuels. *Energies* **2024**, *17*, 6390. https://doi.org/10.3390/en17246390
[12] Tien, C. *Introduction to Adsorption: Basics, Analysis and Applications*; Elsevier, 2019. https://www.sciencedirect.com/science/book/9780128164464

[13]Drioli, E.; Giorno, L. Gas Separation. In *Encyclopedia of Membranes*; Springer, 2015. https://doi.org/10.1007/978-3-642-40872-4_112-1
[14] Aregbe, A. Natural Gas Flaring–Alternative Solutions. *World Journal of Engineering and Technology* **2017**, *5*, 139–153. https://doi.org/10.4236/wjet.2017.51012
[15] CODE of the gas transmission system. https://tsoua.com/wp-content/uploads/2020/12/GTS_Code_Eng_01-01-2021.pdf
[16] Pyshyev, S.; Lypko, Y.; Demchuk, Y.; Kukhar, O.; Korchak, B.; Pochapska, I.; Zhytnetskyi, I. Characteristics and Applications of Waste Tire Pyrolysis Products: A Review. *Chem. Chem. Technol.* **2024**, *8*, 244–257. https://doi.org/10.23939/chcht18.02.244
[17] de Morais, E. G.; da Silveira, J. T.; Schüler, L. M. Biomass Valorization via Pyrolysis in Microalgae-Based Wastewater Treatment: Challenges and Opportunities for a Circular Bioeconomy. *J. Appl. Phycol.* **2023**, *35*, 2689–2708. https://doi.org/10.1007/s10811-023-03104-x
[18] Pyshyev S., Lypko Y., Chervinskyy T., Fedevych O., Kułażyński M., Pstrowska K. Application of Tyre Derived Pyrolysis Oil as a Fuel Component. *S. Afr. J. Chem. Eng.* **2023**, *43*, 342–347. https://doi.org/10.1016/j.sajce.2022.12.003
[19] Miroshnichenko, D.; Shmeltser, K.; Kormer, M.; Sahalai, D.; Pyshyev, S.; Kukhar, O.; Korchak, B.; Chervinskyy, T. Influence of Raw Materials and Technological Factors on the Sorption Properties of Blast-Fuel Coke. *ChemEngineering* **2024**, *8*, 30. https://doi.org/10.3390/chemengineering8020030
[20] Ribun V., Boichenko S., Kale U. Advances in Gas-to-Liquid Technology for Environmentally Friendly Fuel Synthesis: Analytical Review of World Achievements. *Energy Rep.* **2023**, *9*, 5500. https://doi.org/10.1016/j.egyr.2023.04.372

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ВАЗЕЛІНОВІ ОЛИВИ ЯК АБСОРБЕНТИ РІДКИХ ВУГЛЕВОДНІВ З ПРИРОДНИХ І ШТУЧНИХ (ПІРОЛІЗНИХ) ГАЗІВ

Анотація. *У статті проаналізовано способи вилучення рідких вуглеводнів складу C_{5+} з нафтового та природного газів. Розглянуто головні проблеми та недоліки поточних технологій. Вивчено основні фізико-хімічні властивості комерційних вазелінових олив і їхню здатність абсорбувати вуглеводні складу C_{5+} із газів. Встановлено залежність між довжиною карбонового ланцюга та здатністю абсорбуватися вазеліновими оливами.*

Ключові слова: *природний газ, отриманий піролізом газ, очищення газу, вазелінова олива, абсорбція, нафта, вуглеводні, точка роси.*