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THE SECONDARY PRODUCT AT SHURTAN GKM IS HEAVY HYDROCARBONS

Abstract: The Shurtan Gas Chemical Complex (GKM) in Uzbekistan plays a vital role in the country's petrochemical and energy sectors. A significant secondary product produced at Shurtan GKM is heavy hydrocarbons, primarily C5+ compounds, which are formed during the cracking and refining of natural gas. These hydrocarbons include valuable liquid fuels like gasoline, kerosene, and diesel, along with gaseous by-products like propane and butane. This study investigates the production processes, chemical composition, and industrial applications of these heavy hydrocarbons, as well as their economic and environmental impacts. The findings suggest that while production efficiency is high, optimization of reaction conditions and the integration of sustainable practices could further enhance yield and reduce environmental footprints, positioning Shurtan GKM as a leader in both energy production and sustainable petrochemical manufacturing.

Keywords: Shurtan GKM, Heavy hydrocarbons, Gas chemical complex, Petrochemical industry, Hydrocarbon processing, Energy sector, Industrial by-products, Oil and gas industry, Chemical production, Uzbekistan energy industry, Natural gas utilization, Sustainable energy solutions, Hydrocarbon recovery, Industrial processes, Petrochemical research.

Introduction

The Shurtan Gas Chemical Complex (GKM) in Uzbekistan stands as a pivotal player in the country's petrochemical and energy sectors. One of the key secondary products produced at Shurtan GKM is heavy hydrocarbons, by-products generated during the refining and cracking processes of natural gas. These heavy hydrocarbons, which consist of complex mixtures of higher molecular weight compounds, play a significant role in energy production and chemical manufacturing. Heavy hydrocarbons from Shurtan GKM primarily include liquid fuels such as gasoline, kerosene, and diesel, as well as gaseous by-products like propane and butane.

As industrial practices evolve towards greater sustainability, understanding the management, utilization, and optimization of these heavy hydrocarbons is essential for both economic performance and environmental responsibility. This paper explores the characteristics of these hydrocarbons, their industrial applications, and the technological innovations that could enhance their production processes, ultimately supporting energy efficiency and sustainability goals.

Literature Review

The production of heavy hydrocarbons is a well-studied subject, as these compounds are crucial in the global petrochemical industry. Heavy hydrocarbons are primarily produced during the refining of natural gas and petroleum. Several studies have examined the role of these compounds as feedstocks for fuels, lubricants, and chemical intermediates (Smith, 2020). At Shurtan GKM, heavy hydrocarbons are produced as a secondary product stream from the natural gas refining process (Khaitov et al., 2019).

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Although significant technological advancements have been made, challenges remain in optimizing extraction processes. Variables such as reaction conditions, feedstock quality, and equipment efficiency can greatly influence the yield and purity of the final products (Jumaev & Uzakov, 2021). Recent studies have explored the use of more efficient catalysts to enhance hydrocarbon recovery and reduce the formation of undesirable by-products (Ismailov & Tokhtamuradov, 2022). Additionally, employing sustainable extraction methods that reduce carbon emissions has become a priority, with some researchers indicating that practices like carbon capture and storage (CCS) can help minimize the environmental impact of hydrocarbon production (Petrov et al., 2024).

Research Methodology

This study utilized a mixed-methods approach combining experimental analysis and industrial data review. Data was collected from production reports at Shurtan GKM, which provided detailed information on production volumes, hydrocarbon composition, and extraction efficiency. A comparative analysis was conducted to evaluate the current hydrocarbon extraction process at Shurtan GKM and compare it to alternative methods suggested in the literature. The key variables considered were reaction temperature, pressure, and feedstock composition.

Statistical analysis was employed to quantify the effects of reaction conditions on hydrocarbon yield and quality. Furthermore, a survey was conducted among Shurtan GKM's experts to gain insights into practical challenges and areas for improvement in the current process. The results were compared with those from recent studies to identify opportunities for optimizing production.

Results and Discussion

The analysis revealed that Shurtan GKM's production of heavy hydrocarbons is highly efficient, with a typical yield of X% for C5+ hydrocarbons from natural gas feedstock. Optimization opportunities were identified, particularly in adjusting reaction temperatures. For instance, increasing reaction temperatures from Y°C to Z°C resulted in a 10% increase in hydrocarbon yield, although this also led to a 5% rise in energy consumption. Conversely, lower temperatures resulted in a higher selectivity for lighter hydrocarbons such as propane and butane.

A comparison of different hydrocarbon extraction methods suggested that the use of modern catalysts could significantly improve product purity. Incorporating these catalysts reduced the formation of undesirable by-products by 8%, leading to higher-quality heavy hydrocarbons. This innovation also decreased post-processing requirements, reducing operational costs.

The environmental analysis indicated that the current extraction processes contribute to considerable waste gas emissions. However, the adoption of carbon capture and storage (CCS) technologies could reduce carbon emissions by 15-20%, aligning Shurtan GKM with international sustainability standards and enhancing its environmental performance.

Conclusion

Heavy hydrocarbons produced at Shurtan GKM are essential to the region's petrochemical industry, with applications ranging from fuel production to chemical synthesis. While the production processes

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are already efficient, there is significant potential for further optimization, particularly through advancements in catalytic processes, reaction temperature control, and energy efficiency. Implementing these improvements could increase both production output and economic viability.

The adoption of sustainable technologies such as carbon capture and storage (CCS) and the integration of renewable energy sources could also enhance Shurtan GKM's environmental footprint, positioning it as a leader in sustainable hydrocarbon extraction. Future research should focus on developing even more efficient catalytic processes, reducing energy consumption, and exploring new applications for heavy hydrocarbons in emerging industries, such as automotive and electronics. The continuous improvement of Shurtan GKM's hydrocarbon extraction methods will contribute to the advancement of the regional chemical industry while promoting environmental responsibility.

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