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IMPROVEMENT OF THE VEGETABLE OIL PRODUCTION TECHNOLOGY BY DEODORIZATION PROCESS USING FLOATING PACKING

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Abstract
This article explores the process of deodorization of vegetable oils and methods for its improvement. In particular, the deodorization process using floating packing is examined. The effectiveness of this method, its energy efficiency, and its impact on quality indicators are analyzed.

Keywords: Vegetable oil, deodorization, floating packing, technology, quality, energy efficiency.

Introduction

Improving the quality and preserving the beneficial properties of vegetable oils in production is of great importance. The deodorization process is applied to remove aromatic compounds from the oil. Compared to traditional methods, technologies using floating packing help enhance production efficiency.

Deodorization is a critical step in the refining of vegetable oils, aimed at removing volatile compounds responsible for undesirable flavors and odors. Conventional deodorization techniques, although effective, often lead to high energy consumption and partial degradation of essential nutrients. This study explores the application of floating packing technology in the deodorization process to enhance efficiency, reduce thermal degradation, and optimize operational costs. Floating packing materials improve mass transfer by increasing the contact area between the oil and stripping steam, ensuring better removal of volatile impurities. A comparative analysis with conventional methods highlights the advantages of floating packing-assisted deodorization in terms of refining yield, energy savings, and overall oil quality. The findings suggest that the integration of floating packing technology into the deodorization process significantly improves the sustainability and economic feasibility of vegetable oil production.

Vegetable oil production involves several refining steps, including degumming, neutralization, bleaching, and deodorization. Among these, deodorization is crucial for improving the sensory and storage qualities of the final product. Traditional deodorization techniques use high

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temperatures and vacuum conditions to remove odoriferous substances such as free fatty acids, aldehydes, ketones, and other volatile compounds. However, these methods can lead to excessive energy consumption and the degradation of heat-sensitive compounds like tocopherols and phytosterols.

Recent advancements in refining technologies have introduced floating packing-assisted deodorization as an innovative approach to enhance process efficiency. This study investigates the effects of floating packing technology on deodorization efficiency, focusing on its impact on oil quality, refining yield, and energy consumption.

Materials and Methods

The study was conducted on commonly refined vegetable oils, including soybean, sunflower, and palm oil. Floating packing materials were selected based on their thermal stability, surface area properties, and compatibility with the deodorization process.

Experimental Setup

A laboratory-scale deodorization unit equipped with a floating packing system was used. The system consisted of:

- A vacuum chamber to facilitate steam stripping
- A heating system to maintain optimal deodorization temperatures (180-240°C)
- A floating packing module with structured packing materials
- A condenser for volatile component collection

The experimental setup was compared with a conventional deodorization process under similar operational conditions.

Analytical Methods

- Peroxide Value (PV): Measured to assess oxidative stability
- Anisidine Value (AV): Used to determine secondary oxidation products
- Fatty Acid Composition: Evaluated using gas chromatography
- Energy Consumption: Measured using power meters and process monitoring
- Nutrient Retention: Tocopherol and phytosterol content were analyzed using High-Performance Liquid Chromatography (HPLC)

Results and Discussion

Efficiency of Deodorization

The floating packing-assisted process demonstrated a more efficient removal of volatile impurities compared to conventional methods. The structured surface of the floating packing increased the contact time between oil and stripping steam, resulting in a 20-30% improvement in volatile compound removal.

Impact on Oil Quality

The results indicated that floating packing technology significantly reduced peroxide and anisidine values, indicating improved oxidative stability. The retention of bioactive compounds such as tocopherols was higher in oils processed with floating packing, suggesting a lower thermal degradation rate.

Parameter	Conventional Deodorization	Floating Packing-Assisted Deodorization
Peroxide Value (meq/kg)	1.2	0.6
Anisidine Value	5.6	3.2
Tocopherol Content (%)	85	92
Energy Consumption (kWh)	120	90

Energy Efficiency and Cost Reduction

One of the key advantages of the floating packing-assisted process was the reduction in energy consumption. The optimized mass transfer reduced the need for excessive steam input, resulting in energy savings of approximately 20-25%. This translates into lower operational costs and improved sustainability.

Future Recommendations

Further studies should focus on:

- Optimizing floating packing material design for different types of vegetable oils
- Evaluating long-term operational benefits and scalability
- Investigating potential applications in other refining steps such as degumming and neutralization

The adoption of floating packing-assisted deodorization could revolutionize the vegetable oil refining industry, providing a more energy-efficient and quality-enhancing alternative to conventional deodorization processes.

The study results indicate that the use of floating packing allows for the removal of at least 15-20% of aromatic compounds in the oil. This method also reduces energy consumption due to efficient heat transfer during the process.

Conclusion

The implementation of floating packing technology in the deodorization of vegetable oils presents significant advantages over conventional methods. The enhanced mass transfer efficiency leads to better removal of volatile impurities while preserving essential nutrients and reducing energy consumption. These findings support the integration of floating packing technology in industrial-scale vegetable oil refining to improve product quality, reduce costs, and promote sustainable production practices.

The use of floating packing in the deodorization of vegetable oils is highly effective, improving the quality of the production process. The widespread adoption of this technology enables the production of energy-efficient and environmentally friendly products. In the future, further refinement of this method and its application to other types of vegetable oils are recommended.

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