

Promoting Sustainable Solutions for Biomass Residue in Thailand's Palm Oil Mill Industry

Asst. Prof. Dr. Nirattisai Rakmak, a distinguished lecturer at the School of Engineering and Technology, Walailak University, has been leading an innovative academic initiative in collaboration with students from the Chemical Engineering and Pharmaceutical Chemistry Program. The focus of this project is to address the pressing issue of biomass residue generated from palm oil production. By disseminating valuable knowledge, the project aims to promote the efficient use of these residues, turning them into high-value products with significant economic and environmental benefits.

The extraction process of palm oil is known to produce a substantial amount of by-products, including empty fruit bunches, palm fibers, palm kernel shells, and other residual materials. These by-products account for over 60% of the raw materials used in the extraction process. However, current industry practices often lead to the discarding of biomass residues or their use in limited applications. This not only results in inefficient resource utilization but also presents a significant challenge for palm oil mill entrepreneurs who are increasingly seeking effective ways to manage and utilize these residues.

This project plays a crucial role in addressing these challenges by promoting the reuse of biomass residues through advanced technological processes. One of the key outcomes of the project is the development of high-temperature biomass fuel, which is both efficient and commercially valuable. This project was conducted in collaboration with New Biodiesel Co., Ltd., (The company produced Rinthip brand palm oil). This project began with an in-depth study on the utilization of biomass residue from the palm oil extraction process. The study explored the potential of converting these residues into high-heat biomass charcoal, a product that can serve as a sustainable alternative to traditional fuels.

The research, which was further developed as part of the senior projects undertaken by Chemical Engineering students at Walailak University, focuses on creating innovative solutions that address

environmental issues while maximizing the utilization of biomass residues. The project specifically targets the use of empty fruit bunches, palm fibers, and palm kernel shells as raw materials for producing high-heat biomass charcoal through a process known as torrefaction. Torrefaction is a thermal process that involves heating biomass at temperatures ranging from 200 to 300 degrees Celsius in an oxygen-free environment for 10 to 30 minutes. The end product of this process possesses properties similar to coal, making it a viable and sustainable alternative for industrial use.

The adoption of torrefaction technology not only reduces the amount of biomass residue generated by the palm oil mill plant but also offers the industrial sector an opportunity to replace coal or other solid fuels with high-temperature biomass fuel. Furthermore, the project has the potential to generate new revenue streams through the sale of high-heat biomass charcoal products in both domestic and international markets, thereby enhancing the economic viability of the palm oil industry.

Moreover, On February 19, 2024, Asst. Prof. Dr. Nirattisai Rakmak furthered this initiative by collaborating with the Department of Industrial Works, Provincial Industry Offices, and the Industrial Council, including from Chumphon, Krabi, Phang Nga, Surat Thani, and Nakhon Si Thammarat. Together, they organized a training and knowledge transfer event for palm oil processing entrepreneurs from across the country. The event held at Diamond Hotel in Surat Thani Province, attracted 55 representatives from 16 palm oil mill factories.

This training session exemplifies the collaboration between universities, industries, and government agencies in developing sustainable innovations that effectively address both economic and environmental needs. The focus of the training was on enhancing the value of biomass residues from the palm oil mill factory. Participants were provided with insights on repurposing these residues as soil conditioners, organic fertilizers, and high-heat biomass charcoal. This knowledge-sharing effort is a vital component in raising awareness and boosting the competitiveness of Thailand's palm oil industry on the global stage. The success of this project has far-reaching implications. It not only adds significant value to biomass residues from palm oil

mills but also contributes to solving environmental issues caused by production waste. By promoting more efficient resource utilization, the project supports community economic development and strengthens the domestic palm oil mill industry, positioning it for sustainable competition in the global market.