

Collaborating for a greener future

UTM embarks on a research journey with JTS Group for biochar slow-release fertiliser

BY FATIAH MANAF

THE COLLABORATION between industry and academia is essential for a nation's progress, fostering economic growth and sustainability. Realising the importance of this industry-academia collaboration, Universiti Teknologi Malaysia (UTM) has joined forces with JTS Group, a company specialising in biomass and dross recycling, to research biochar slow-release fertiliser.

According to the Chair, Resource Sustainability Research Alliance and Fellow, Process Systems Engineering Centre (PROSPECT), UTM, Prof Ir Dr Haslenda Hashim, this synergistic effort between UTM and JTS marks just the beginning of their research journey, with the potential for further collaborative projects in the future.

"Our networking with JTS began last year, and it's been a fascinating journey because we share common interests, particularly our deep concern about climate change. One of the primary motivations for our venture into biochar research is to address climate change-related issues," said Haslenda.

"We work closely with JTS. At UTM, we conduct experimental work on biochar as a slow-release fertiliser containing a high concentration of macro and micronutrients for soil improvement. In this research, UTM's role is synthesising biochar slow-release fertiliser, designing the granulation process, conducting characterisations, and performing performance analysis. The reason and the benefit of working with JTS are because, at UTM, we focus more on research, while companies like JTS are experts in commercialisation."

BRINGING REAL-WORLD IMPACT

Haslenda expressed her team's desire to transition their research from the laboratory to the industry. She highlighted the valuable aspect of industry-academia collaboration, which opens up possibilities for their research to reach the market and have a real-world impact.

She shared that at UTM, they have a strategic initiative called Consortium of Academia, Industry, Government, and Society for Synergistic Transformation (AIMS4STAR) as a platform to provide

Prof. Ir. Dr Haslenda Hashim.



solutions to common problems faced by the industry via the quadruple helix innovation model.

"In the university, our primary focus is on research. However, if we aim to commercialise our work, it would be beneficial to collaborate with the industry. Industries possess valuable insights and can provide input based on market demands and various perspectives on marketing strategies. They understand the industry's challenges, making the research we conduct industry-driven and potentially suitable for commercialisation."

BIOCHAR SLOW-RELEASE FERTILISER

Haslenda said one of the primary motivations for engaging in this research with JTS was to address the pressing issue of climate change. Their study focuses on biochar slow-release fertiliser, converting empty fruit branches, a waste product in the palm oil industry, into a valuable fertiliser rich in macro and micronutrients for soil improvement. This approach addresses industrial waste challenges and contributes to reducing greenhouse gas emissions.

"If you look at the inorganic fertiliser, it can contaminate groundwater and impact soil nutrients. On the other hand, organic fertiliser, such as the slow-release fertiliser derived from empty fruit bunches, can enhance soil texture, prolong water retention, and often necessitates fewer applications than inorganic fertilisers.

"This reduction in usage results in decreased emissions of CO₂, ammonia, and the significantly more harmful nitrous oxide, which is 298 times more harmful than CO₂. It is how slow-release fertilisers can effectively address environmental challenges and promote sustainability," she explained.

Haslenda emphasised that their partnership with JTS has been highly



During a visit to Taiyo Biomass, a company under JTS Group.



UTM team's visit to JTS Group's facilities in Pasir Gudang, Johor.

beneficial. The collaboration reduces the need for JTS to establish its laboratory by gaining access to the university's lab facilities. Furthermore, the UTM team gains valuable input and insights from industrial players like JTS, offering different perspectives. She stressed the importance of this unique combination and its significance for the project's future success. – @Green

UTM team.



Championing sustainability

THE PROCESS Systems Engineering Centre (PROSPECT) is one of the research centres at Universiti Teknologi Malaysia, operating within the Faculty of Chemical and Energy Engineering (FKT).

In the face of today's process engineering challenges, marked by unstable energy prices in the market and mounting concerns about climate change, PROSPECT has broadened its area of expertise. It now encompasses process systems and a more comprehensive range

of subjects, including sustainability, renewable energy, waste-to-wealth initiatives, and carbon emission reduction and mitigation across various sectors.

PROSPECT is consistently dedicated to innovating solutions for developing process systems that are cleaner, safer, more energy-efficient, cost-effective, and sustainable. This mission aligns with PROSPECT's "Sustainability Engineering" tagline, which reflects its fundamental philosophy and expertise in creating and engineering sustainable

products, process systems, resource management, and planning.

Over the years, PROSPECT has served the industry, government ministries, and communities by offering its expertise in the form of consultations, research, and innovation in resource conservation, energy digitalisation, renewable energy systems, waste-to-wealth practices, and circular economy strategies. These efforts are to support industrial sectors to achieve net-zero greenhouse gas emissions.

Redefining the industry norms

JTS Group aims to promote greener supply chains by minimising landfill reliance through dross recycling and transitioning to alternative oils



JTS Group's visit to the School of Chemical and Energy Engineering, Universiti Teknologi Malaysia.

BY FATIAH MANAF

COMPANIES from various sectors increasingly acknowledge the importance of embracing eco-friendly practices in today's rapidly evolving world focused on sustainability. Embracing sustainability goes beyond a simple shift; it involves a holistic approach covering every aspect of the supply chain.

JTS Group emerges as a trailblazer in this landscape, leading the way in this transformative shift. Despite sustainability's inherent challenges to energy-demanding industries like aluminium production, JTS is resolute in its mission to redefine norms through inventive initiatives to minimise its environmental footprints.

"JTS has always been involved in recycling. Our goal has been resource recovery and management of raw materials that we obtain from the supply chain. Currently, JTS's main focus has been on

dross recovery to produce aluminium that can be used back in the supply chain. Through this process, we avoid valuable resource from being disposed into landfills," explained JTS Group Research and ESG Director Tridansh Bahadur Pandey.

He believed that landfilling was the least optimal means of resource management. He stressed the importance of minimising landfill usage and facilitating material reuse through the circular economy ecosystem.

REDUCING CARBON EMISSIONS

Tridansh emphasised that increasing material utilisation within supply chains could reduce demand for virgin resources, thus lowering carbon emissions linked to extraction (mining) and production of virgin raw materials. He underscored the benefits of curbing landfill dependency: reducing carbon emissions and disposal activities, and the preservation of unpolluted land.

"Landfilling comes with its negative aspects such as the utilisation of valuable lands and the loss of potentially valuable resources. These aspects increase the carbon footprint of the nation. Generally, landfills should be the last resort for waste management. We hope to address these points through our activities, particularly in dross management, to reduce carbon emissions," he elaborated.

JTS Group Founder Ramkripal Pandey added that the company's efforts that contribute to carbon sequestration and reduction of environmental degradation encompass a range of activities, including conducting research and development (R&D), implementing climate change mitigation programmes, and promoting sustainable practices in agricultural and industrial processes. These endeavours are undertaken to achieve both

economic progress and environmental sustainability.

SWITCHING TO GREENER FUEL

Tridansh provided further insight into JTS's research on fuel switching. He said previously, JTS had been using heavy fuel oil for smelting. The use of fossil fuels is a common practice in the smelting industry due to the need for high heat energy during the smelting process.

"The industry practice typically involves using fossil fuels, including liquid fuels, gas fuels, or solid fuels like coal. Electric furnaces do exist but are more suitable for specific applications like stainless steel production and other high-end metal melting processes. However, they are not as applicable for dross melting or most aluminium smelting facilities."

He explained that JTS's transition to alternative fuels started in 2019 when numerous organisations committed to decreasing emissions and fossil fuel consumption. The government entities in Johor also suggested a shift away from heavy fuel oil due to its environmental implications.

Tridansh mentioned that researching, developing, and implementing the transition to alternative oil took approximately six to nine months to complete. He noted that JTS reported a significant achievement during this phase, highlighting a remarkable 30 per cent decrease in emissions and fossil fuel usage.

"Our primary goal at the time was to enhance the working environment for our immediate workforce by addressing smog generation caused by heavy fuel oil usage. We explored various oil alternatives available in the market, considering the system in place and safety concerns.

"Initially, we considered the possibility of switching to natural gas. However,

SIRIM QAS International Sdn Bhd CEO Puan Nur Fadhilah Muhammad presents the Product Carbon Footprint award to JTS Group.





MyHijau mark presentation organised by the Malaysian Green Technology and Climate Centre (MGTC).

the safety requirements associated with natural gas usage are high. The safety mechanisms are primarily electronic and automated, which is not ideal for our dusty environment, increasing the potential for operational and safety-related failures.

“We focused on using liquid-based renewable fuels. Solid biomass was another potential option, but the storage requirements were large and not conducive to our environment. Thus, we concentrated on utilising liquid-based alternatives.

“This led us to design a system, develop our patented idea, conduct trial runs, and progress to using liquid oil. We ensured our system design allowed flexibility, so we could use biodiesel, bio-oils, or even diesel, as long as they were cleaner than heavy fuel oil.”

BECOMING MORE SUSTAINABLE

Tridansh explained that as the facility was designed to transition away from heavy fuel oil, JTS Group became immersed in renewable energy. The company was informed that its efforts were groundbreaking in utilising renewable fuels for energy, making them eligible to be voluntary carbon credit originators.

JTS’s products now exhibited lower emissions, fostering a cleaner workforce environment. Additionally, emissions from its stack, which encompassed carbon dioxide and sulphur, experienced a reduction due to using clean and renewable fuels.

“While designing the system, we were careful not to utilise edible oils meant for food usage. We wanted to avoid competing with the food market for such oils,

which could impact cooking oil availability. Our focus was on oils intended for industrial use, aligning with our industrial application.”

Focusing on achieving Sustainable Development Goals (SDGs) through cleaner energy has led to a comprehensive assessment of supply chains and vendor practices. Therefore, this shift away from using heavy fuel oil has a ripple effect on JTS’s dross recycling services, indirectly guiding its customers towards cleaner methods and enabling their end-product production to align with elevated environmental standards.

“Our efforts align with the current trend of using renewable fuels, benefiting both the industry and the environment. Aluminium, a key component in our operations, now emerges as a cleaner and greener ingredient.”

RECEIVING MYHIJAU RECOGNITION

JTS has been awarded the MyHIJAU mark, a prestigious green recognition scheme officially endorsed by the Malaysian government. This programme brings together certified products and services that conform to local and international environmental standards, all united under a single distinguished mark.

“We began this journey during the Covid-19 pandemic. We worked with SIRIM, and fortunately, they were receptive to making aluminium production cleaner and more environment-friendly,” Tridansh shared.

He mentioned that one of the prerequisites for obtaining the MyHIJAU mark was to acquire a carbon footprint label

for its products. However, during that period, there were no established product category rules for aluminium.

Consequently, SIRIM invited JTS to cooperate in formulating these product category rules. SIRIM conducted the groundwork and developed the rules, which were subsequently finalised. Following the rule’s finalisation, JTS audited its aluminium products.

“SIRIM assessed a wide range of data, including examining our electricity consumption, reviewing the journeys we undertook, considering our scope one emissions, scope two emissions, and to a certain extent even our scope three emissions.

“The scope three emissions were assessed based on the availability of data. The assessment covered aspects such as transportation of raw materials, energy consumption, utility usage, and the quantity of waste sent to landfills. All these factors were calculated, and upon successfully proving the reduction and impact, we obtained the carbon footprint label. Then, we became eligible to apply for the MyHIJAU mark.”

HIGHER COST FOR GREATER BENEFITS

“Obtaining the MyHIJAU mark proves our products are greener. I must add that the cost is significantly higher because using alternative fuel is more expensive today. However, given the environmental benefits were profound, we were willing to make the switch and bear the additional economic cost. As a Malaysian company, we are committed to play our part and be active in Malaysia’s drive to reaching its sustainability goals.

“Obviously, for our programme, we tried to ensure that we were sustainable and economically beneficial without significantly impacting our clients. What we did was that as we proved that we had the MyHIJAU mark, we could approach our clients and inform them that we have a process that is cleaner and more environment-friendly.

“It’s a quantity game; the more we recycle for you, the cleaner your products become, and the more environment-friendly your waste stream management. People now see that we are genuinely dedicated to sustainability and going green.”

Despite the industry’s high energy demands, Tridansh emphasised that achieving sustainability proves that dedication and commitment can drive sustainability efforts, regardless of a company’s size.

He further explained that after obtaining the MyHIJAU mark, JTS received inquiries from overseas certification bodies interested in certifying its products, which opened new opportunities for the business, potentially allowing it to expand to countries like Korea, Japan, and Europe.

Having embarked on various sustainability initiatives, such as obtaining the MyHIJAU mark, heavily participating in recycling efforts, and transitioning away from heavy fuel oil, JTS is unwavering in its commitment to environmental responsibility. This dedication is evident in every facet of the company’s operations, whether biomass or aluminium dross recycling.

As a research-driven company, JTS collaborates extensively with local and international experts. One noteworthy partnership, for instance, involved collaboration with Universiti Teknologi Malaysia (UTM) in biochar research. These endeavours collectively underscore JTS’s dedication to promoting a greener future. — @Green

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Tridansh Bahadur Pandey, representing JTS Group, accepting the SIRIM CFP 017:2020 Product Carbon Footprint award from SIRIM CEO Dato’ Indera Dr Ahmad Sabirin Arshad