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TGEM unveils breakthrough nickel tech amid market turmoil

By **Adianto P Simamora**

An Indonesian-based technology firm has unveiled a breakthrough nickel processing technology that not only produces high-grade battery materials but also supports a circular economy by turning industrial waste into valuable by-products, positioning itself as a key player in the Western EV supply chain.

The innovation comes at a critical time for the nickel industry, which is grappling with geopolitical tensions, ESG pressures, and what one executive called an "unfair pricing mechanism" that has battered the sector.

Romy Ramadhani, Head of Corporate Finance at Trinitan Green Energy Metals (TGEM), detailed the company's innovative approach at the 4th Nickel Producers, Processors, and Buyers Conference in Jakarta. The annual event was organized by *Petromindo* and *CoalMetalAsia* Magazine.

Romy explained that TGEM's patented "Step Temperature Acid Leach" (STAL) technology is designed to thrive in this challenging environment by creating a cost-efficient and sustainable pathway for producing Class 1 nickel, primarily in the form of Mixed Hydroxide Precipitate (MHP), used in EV batteries and other high-value applications.

An unfair market

The nickel market is facing a perfect storm of challenges. The geopolitical split between the West and China has bifurcated supply chains, while intense scrutiny around ESG and environmental compliance has raised the bar for all producers. But according to Romy, one of the biggest and most unfair challenges is the market's pricing structure.

He pointed to a fundamental imbalance where the price of Class 1 nickel is unfairly dragged down by the dynamics of the much larger Class 2 nickel market, which serves the stainless steel industry. "The market still seeks one single price," he said. "But in actual trading conditions, the sector is separated between the supply of Class 1 nickel, which is primarily going to work in EV battery manufacturing, [and] the Class 2 nickel, which is going to work in the stainless steel sector."

This has been problematic for Class 1 producers. "It's challenging for those who produce into the Class 1 nickel channel like us, producing the nickel MHP, as we currently must apply the Class 2 nickel pricing to our shipments due to the lack of a differentiated market for Class 1 product," he explained.

This structural flaw, combined with slowing demand from China's massive stainless steel sector, has put downward pressure on prices

"What we've seen in the last couple of years, especially in the last year, is this dynamic where Chinese stockpiling and the lack of a differentiated Class 1 nickel trading environment have weighed on prices," he stated.

"So, I think this is one of the current challenges our industry has. One of the biggest focus areas for us at TGEM is the continuous work on cost efficiency, which we believe is one of the most important components to achieve and maintain our competitiveness and resiliency in this current pricing and geopolitical environment for Class 1 nickel."

A technological breakthrough

TGEM's answer to this challenge lies in technology developed over the last 15 years. The company's patented STAL process is a hydrometallurgical method that can extract nickel and other valuable compounds from laterite ore.

The company has already commercialized the technology (first shipment in Q4 2023) at its first production facility near Bogor, West Java. It is in commercial operation with an installed capacity of 3,200 tons of Mixed Hydroxide Precipitate (MHP) per year. The quality of the MHP produced is exceptionally high, with a nickel content of greater than 50%, far exceeding the market standard of around 30%-40%.

This high-quality product has already attracted significant international interest. Romy revealed that TGEM has delivered its MHP to major cathode producers in South Korea and has been working with trading companies from Japan. "… and we have offtakers who are looking for a non-FEOC MHP producer, for example, like Indian companies we have been working with. Really, it's a very aggressive sourcing discussion we are having with these customers nowadays," he added, noting further interest from the UK, Germany, as well as several US-based companies looking to commercialize their own downstream nickel refinery processes. "For TGEM, our primary strategy continues to be our focus on supplying MHP to the US and allied supply chains," he said.

This ambition is fueled by a promising outlook for Class 1 nickel demand in North America, which is projected to grow significantly in the coming years. TGEM plans to scale up its operations dramatically to meet this demand, with an ultimate goal of building a multi-phase "IGNITE Ecopark" in Sorong, Southwest Papua, with a planned capacity of around ~50,000 tons of nickel per year over time, subject to permitting, partnerships, and market conditions.

But the true breakthrough of TGEM's technology lies in its ability to support a circular economy. The company has developed a second, derivative technology called "STAL Loop," which is designed to process nickel-based industrial waste streams instead of mined lateritic ore.

" STAL Loop enables us to utilize many nickel-based waste products from several industries as a feedstock," Romy said. This includes processing waste like spent catalysts from the oil and gas industry, fly ash, and electronic waste to extract nickel and other valuable metals like molybdenum and vanadium.

This technology addresses a critical missing link in Indonesia's industrial catalyst ecosystem. Currently, valuable waste like spent catalysts is often exported. TGEM's technology allows it to be processed domestically, creating a circular flow where waste from one industry is reprocessed to become the feedstock for another.

Even more impressively, the STAL process is designed around zero-waste principles. Beyond producing MHP, TGEM's technology can extract other valuable compounds from the ore, such as magnesium products and iron oxide. The final residue, Romy explained, can be converted into a cement alternative material.

"Our ultimate goal is to produce no waste, meaning all the waste or residue can be turned into valuable by-products. Waste management like tailing dams or dry stacking was never our plan as we developed our STAL technology," he said, contrasting TGEM's approach with the incumbent technologies that produce vast amounts of tailings waste.

In a world increasingly focused on sustainability and circularity, this technological edge could be what sets TGEM apart, allowing it to navigate the industry's challenges and emerge as a key, sustainable supplier for the global energy transition. C