Briefing: TMETC-15 & TCPC 2025 Conference Insights

Executive Summary

The combined 15th Thailand Metallurgy Conference (TMETC-15) and 5th International Thailand Corrosion Prevention and Control Conference (TCPC 2025), held on November 20–21, 2025, at BITEC in Bangkok concurrently with METALEX 2025, served as a critical forum for academia and industry. Under the theme **'Academic-Industrial Linkage Towards Innovative Metallurgy & Emerging Applications,'** the conference highlighted two intertwined imperatives driving the future of the materials and metallurgy sectors.

The first critical takeaway is the urgent need for **Technological Transformation**. Discussions, particularly in the special session "I Am to AI," underscored that the field must rapidly evolve from a reliance on traditional, individual expertise ("I Am") to a new paradigm augmented by Artificial Intelligence (AI). Engineers who fail to adopt AI and Digital Transformation (DX) skills risk becoming obsolete, or "falling off the train." This technological shift demands a fundamental change in the workforce, moving beyond established mechanical competencies to embrace a multidisciplinary skillset incorporating electronics, software, and data science.

The second major theme is the necessity of **Strategic and Sustainable Adaptation**. Panel discussions emphasized that amidst geopolitical disruptions and slowing economic growth, the industry's survival and growth depend on pivoting towards new frontiers. This involves embracing sustainable practices like the circular economy, decarbonization, and urban mining, while strategically targeting emerging high-value sectors such as rail transport, aviation, medical devices, and advanced agriculture. The consensus is that competing on price with global players is untenable; differentiation through technology and strategic realignment is the only viable path forward.

1. Conference Overview

The joint TMETC-15 and TCPC 2025 conference convened leading academics, researchers, and industry professionals to foster collaboration and address key challenges in metallurgy and materials science.

- **Event:** 15th Thailand Metallurgy Conference (TMETC-15) & 5th International Thailand Corrosion Prevention and Control Conference (TCPC 2025)
- **Date:** November 20-21, 2025
- **Venue:** BITEC, Bangkok, Thailand
- **Theme:** “Academic-Industrial Linkage Towards Innovative Metallurgy & Emerging Applications”
- **Primary Focus Areas:**
    - Structure and Properties
    - Metal Processing
    - Corrosion Technology & Management
    - Metallurgical Industrial Applications & Solutions
- **Industry Sessions:** The program was structured around key industrial sectors, including Energy, Infrastructure & Construction, Manufacturing & Process Industries, and Transportation & Logistics.

Key Organizing and Sponsoring Bodies:

Category	Organizations
Organizers	• Chulalongkorn University (CU) • CRRC Qingdao Sifang Co., Ltd. • Department of Metallurgical Engineering, Faculty of Engineering, CU • Metallurgy and Materials Science Research Institute (MMRI), CU • Ministry of Higher Education, Science, Research and Innovation • National Metal and Materials Technology Center (MTEC) • National Science and Technology Development Agency (NSTDA) • RX BITEC • Thai Corrosion of Metals and Materials Association (TCMA)
Co-organizers	• Burapha University • Burapha University, Chanthaburi Campus • Chiang Mai University • China-Thailand "Belt and Road" Joint Laboratory on Rail Transport • Iron and Steel Institute of Thailand • Kasetsart University • Khon Kaen University • King Mongkut's University of Technology Thonburi • King Mongkut's University of Technology North Bangkok • Naresuan University • Prince of Songkla University • Qingdao Aokang Quality Inspection Technology Co., Ltd. • Rajamangala University of Technology Isan • Rajamangala University of Technology Isan Khonkaen Campus • State Key Laboratory of Coatings for Advanced Equipment • Suranaree University of Technology • Synchrotron Light Research Institute (Public Organization) • Thai Foundry Association • Thai Galvanizing Association • Thai Heat Treating Association • Thailand Electroplating Industrial Network Association • Thailand Powder Metallurgy Association
Diamond Sponsors	• JST Group • POSCO-Thainox Public Company Limited • Thai Tohken Thermo Co., Ltd.
Gold Sponsors	• Outokumpu (S.E.A.) Pte Ltd. • Thailand Powder Metallurgy Association
Exhibitors	• Coax Group Corporation Ltd. (Headquarter) • Integrated Global Services (IGS) • H.J.Unkel (Thai) Limited • Helmut Fischer (Thailand) Co., Ltd. • Keyence (Thailand) Co., Ltd. • Metrohm Siam Ltd. • Thai Parkerizing Co., Ltd. • Thai Marine Protection Co., Ltd.
Supporter	• Solution Center Co.,Ltd. • Thailand Electroplating Industrial Network Association

Presentations	The technical program was extensive, featuring **81 presentations** in total: • 5 Plenary lectures • 5 Keynote lectures • 33 Invited lectures • 31 Oral presentations • 7 poster presentations
Participants	• The conference saw a strong turnout with a total of **302 participants**, consisting of **237 general participants** and **65 sponsor representatives**.

2. Core Theme 1: The Imperative of AI and Digital Transformation (AI-DX)

A central message throughout the conference was that the integration of artificial intelligence and digital skills is no longer optional but essential for survival and competitiveness.

The "I Am to AI" Paradigm Shift

The special session titled "I Am to AI: Metallurgical Engineering in a New Step of the Future — Who will get on the train, or be left behind?" delivered by Professor Chatchai Somsiri, framed this transformation as a move from an "I Am" (ตัวฉันเป็นเลิศ - "I am excellent") mindset of individual expertise to one of AI-augmented intelligence.

- **Urgency:** It was starkly noted that engineers who are not equipped with AI will "fall off the train" (ตกขบวน) and be left behind in terms of productivity and quality.
- **AI Capabilities:** AI was presented as a powerful tool for metallurgists, capable of:
    - Performing complex calculations (thermodynamics, heat transfer).
    - Generating code (especially Python) for data processing and modeling.
    - Analyzing big data to identify patterns and solutions.
    - Predicting microstructures and mechanical properties.
- **Critical Caveat:** A strong warning was issued against blind reliance on AI. Professor Chatchai described AI as "a smart kid, but can't be trusted 100%," citing instances where AI generated incorrect scientific data (e.g., wrong enthalpy values) and fabricated academic references. The necessity of **engineering judgment** to validate AI outputs was heavily emphasized.

Industry Skill Gap: From Mechanical to Mechatronic

A panel discussion, "Metalworkers' Circle," further detailed the practical implications of this technological shift on the Thai industry.

- **From "Heavy" to "Light":** Panelists contrasted Thailand's historical strength in mechanical skills—summarized as "ใหญ่ ยาว หนา หนัก" (big, long, thick, heavy)—with the future's demand for products that are "เล็ก สั้น บาง เบา" (small, short, thin, light) and integrate sophisticated electronics.
- **The Value Chain Problem:** The concept of the Software-Defined Vehicle (SDV) was used to illustrate a critical vulnerability. The value chain progresses from **Software -> Electronics**

(Control Board) -> Mechanics. Thai industry is proficient only in the final, lowest-value mechanical stage, lacking the electronic and software design skills to capture high-value work.

- **Real-World Examples:** The gap was highlighted with examples of Chinese firms requesting bids for components like shock absorbers and window seals that integrate sensor chips for data collection—a capability that Thai manufacturers struggled to provide, causing them to lose orders.

A Call for Educational Reform

The conference issued a clear call to action for academia to adapt its curriculum to meet these new demands. Professor Chatchai advocated for universities to integrate AI and data science directly into their materials science programs, proposing the creation of a **"Metallurgy (materials) Informatic engineer"** curriculum. This echoes the panel's call for the workforce to urgently develop **"DX skills" (Digital Transformation)** alongside fundamental knowledge.

3. Core Theme 2: Sustainability and Strategic Industry Realignment

The second major theme focused on the need for industry to navigate global economic and environmental pressures through a dual focus on sustainability and strategic market diversification.

The Rise of the Circular and Green Economy

Discussions repeatedly highlighted the global shift from a linear (produce-use-dispose) economy to a **circular economy**.

- **Key Concepts:** Terms like decarbonization, **Green Transformation (GX)**, and **urban mining** (recycling metals from used products) were identified as central to the industry's future.
- **Technological Relevance:** This trend reinforces the importance of technologies like the Electric Arc Furnace, which is crucial for steel recycling and remains a "state-of-the-art" process in the context of sustainability.
- **Environmental Pressures:** The reality of climate change was invoked as a primary driver, making green skills and sustainable practices a non-negotiable aspect of future industrial operations.

Identifying New Industrial Frontiers

With projected domestic GDP growth slowing to under 2%, panelists argued that the industry must actively pivot from traditional markets to new, high-potential sectors.

- **Part Transformation:** A concerted effort is underway within the Federation of Thai Industries to promote "part transformation," encouraging manufacturers to diversify into new areas.
- **Identified Growth Sectors:**
    - **Rail Transport:** Leveraging domestic projects for single and dual-track railways.
    - **Aviation Parts:** Capitalizing on geopolitical shifts that are moving supply chains away from China.
    - **Medical Devices:** Moving beyond simple Class 1 products to more advanced devices.
    - **Defense Industry:** Building domestic capabilities for national security.

- **Agricultural Machinery:** Aligning with national strengths in agriculture and food security.

4. Key Presentations and Sessions

Session Type	Title / Topic	Key Speaker(s) / Presenter	Insights
Special Session	I Am สู่ AI : วิศวโลหการในก้าวใหม่แห่งอนาคต (I Am to AI: Metallurgical Engineering in a New Step of the Future)	Dr. Chatchai Somsiri, MENAM Stainless Wire Public Co., Ltd.	Argued for the urgent adoption of AI by metallurgists, detailing its power as a tool while warning against uncritical reliance and calling for educational reform. [Video]
Panel Discussion	ล้อมวงสนทนาชาวโลหะ: แบ่งปันประสบการณ์ สู่เส้นทางอาชีพแห่งอนาคต	นายวิกรม วัชระคุปต์ กรรมการบริหาร สภาอุตสาหกรรมแห่งประเทศไทย นายพัฒนศักย์ ฮุ่นตระกูล ประธานกิตติมศักดิ์ กลุ่มอุตสาหกรรมเครื่องจักรกลการเกษตร สภาอุตสาหกรรมแห่งประเทศไทย นายสุพจน์ สุขพิศาล ประธานกลุ่มอุตสาหกรรมชิ้นส่วนและอะไหล่ยานยนต์ สภาอุตสาหกรรมแห่งประเทศไทย นายธนิต เคนหงส์ Integrated Global Services Inc. ดำเนินรายการโดย รศ.ดร.ปริทรรศน์ พันธุบรรยงก์ นักวิชาการอิสระ	Analyzed the disruption facing Thai industry, highlighting the skills gap between traditional mechanical and modern electronic/digital needs, and identified new strategic growth sectors. [Video]
Plenary Lecture (PL-01)	Bridging Science and Industry: Data-Driven Strategies for Reliable Operation in High-Corrosivity Environments	Dr. Matina Thammachart, PTT Exploration and Production PCL	-
Plenary Lecture (PL-02)	Roles of the Metallurgist in Impacting Industries: from atomic diffusion kinetics to structural analysis, from pico-liter soldering to micro-liter additive laser manufacturing, from jewelry investment casting to Tesla giga-casting, and from thermodynamic simulations to AI- and machine learning driven alloy formulation and implants design	Assoc. Prof. Dr. Boonrat Lohwongwatana, Chulalongkorn University	-
Plenary Lecture (PL-03)	Advanced Electroplating Solutions for New Energy Applications	Asst. Prof. Dr. Jiaqian Qin, Chulalongkorn University	-
Plenary Lecture (PL-04)	Outlook of Emerging DLC and Diamond Related Coating Materials for Manufacturing Industries	Dr. Da Yung Wang, Aurora Scientific Siam Corporation Ltd., Thailand	-
Plenary Lecture (PL-05)	Corrosion Control and Passivation Quality Evaluation Method for Stainless Steel Rail Vehicles	Dr. SUN Xiaoguang, Aokang Quality Inspection Technology Co., Ltd., China	-

5. Association Meetings and Professional Collaboration

The event also facilitated the strategic meetings of key professional bodies, including the Thailand Powder Metallurgy Association (ThaiPMA) and the Thai Corrosion of Metals and Materials Association (TCMA). These meetings emphasize the conference's role as a hub for professional networking and the strengthening of the metallurgical and corrosion control community in Thailand.

6. Conference Awards and Recognition

The conference recognized excellence in research and presentation through a series of prestigious awards.

Award Name	Category	Winner(s)	Affiliation	Topic
Thailand Metallurgist Award 2025	Academic	Asst. Prof. Dr. Songob Khumkoa	Institute of Engineering, Suranaree University of Technology	-
	Industry	Navy Captain Dr. Pinai Mungsantisuk	Thai Marine Protection Co., Ltd.	-
Young Outstanding Thailand Metallurgist Award 2025	Academic	Dr. Chanun Suwanprecha	National Metal and Materials Technology Center	-
	Industry	Dr. Chaipat Tangpatjarone	Focuz Manufacturing Co., Ltd.	-
TCMA Award	Champion	Yi Qin	University of Science and Technology Beijing, China	Study on The Influence of Surface Microstructure and Chemical Configuration of Ni-Zn-P Coating on Its Hydrogen Permeation Behavior
	1st Runner-Up	S. F. Chou	National Taiwan University of Science and Technology & Industrial Technology Research Institute, Taiwan	Advanced Zn-Al-Mg Protective Coating for PV Mounting Structures in Harsh Atmospheric Environments
	2nd Runner-Up	Mr. Chanin Tangpongkitjaroen	Chulalongkorn University, Thailand	The effect of temperature on corrosion of bismuth-40tin alloys in 3.5 wt.% NaCl solution
POSCO-Thainox Metallurgy Award	Graduate (Winner)	Mr. Manusavee Taksadej	Thai Tohken Thermo Co., Ltd. & Chulalongkorn University, Thailand	Adhesion Performance of DLC Coating on SUJ2 Steel Hardened by Atmosphere controlled and Vacuum Controlled Process
	Graduate (Runner-Up)	Mr. Tanabodee Praditja	Thai Tohken Thermo Co., Ltd. & Chulalongkorn University, Thailand	Influence of Gas Nitrocarburizing and Solution Nitriding on the Microstructure and

				Mechanical Properties of SUS430 Stainless Steel
	Undergraduate (Co-Winner)	Miss Suphannika Kaewkantha	Chulalongkorn University, Thailand	The Influences of Steel Matrix and Composition on The Behavior of Nitrocarburizing White Layer
	Undergraduate (Co-Winner)	Miss Phatthira Thammachob	Chiang Mai University & National Metal and Materials Technology Center, Thailand	Manufacturing Pathways and Peening Synergy: Effects of Initial Surface Quality, Shot Media, and Peening Parameters on MIM and MEX 17-4PH Stainless Steel
Best Poster Presentation Award	-	Miss Sumita Chailoi	Suranaree University of Technology, Thailand	Biosynthesis of Silver Nanoparticles Using Clove, Cinnamon and Star Anise as Reducing Agents