

ASEAN Journal of Process Control

Highlights of Keynote Speech at PCVS2024

Emissions Digital Twin (EDT)

Dr. Shahrul Azman Zainal Abidin

Honeywell International Sdn Bhd

*Corresponding Author: shahrulazmanbin.zainalabidin@honeywell.com

Dr. Shahrul Zainal Abidin emphasized the transformative role of digital twin technology in managing greenhouse gas emissions, focusing on engineering and operational digital twins. Drawing on decades of experience in process simulation, he highlighted their potential to combine historical operational data with simulated process data to optimize emission management.

1. Key Concepts and Functionality

1.1 Engineering Digital Twin

Integrates process simulation models with operational data for comprehensive insights across the operational envelope. It uses machine learning and AI to predict emissions, optimize energy usage, and assess new process configurations. Also, it enables soft sensing as a cost-effective alternative to physical sensors for emissions monitoring.

1.2 Operational Digital Twin

This dynamic simulation model provides real-time insights into transient and upset conditions. Digital twin facilitates process adjustments to minimize emissions, optimize control strategies, and predict equipment degradation for timely maintenance.

1.3 Applications in Emission Management

- a) Combines simulated and real-time data to fill gaps in operational data, enabling precise emission predictions under varying conditions.
- b) Assists in developing actionable insights to achieve sustainability goals, including emission reduction and energy efficiency.
- c) Provides tools for operators to test "what-if" scenarios and optimize processes without compromising environmental targets.

2. Benefits of Digital Twin Technology

Digital Twin enhances decision-making by visualizing emissions data in real-time via dashboards. It reduces dependency on physical sensors by employing soft sensors validated periodically against real data. Digital twin supports training through operator simulators, replicating actual control systems to refine emission management strategies.

3. Closing Note

Dr. Shahrul concluded by emphasizing the pivotal role of digital twins in achieving energy and emission optimization. By leveraging these technologies, industries can address sustainability challenges while ensuring operational efficiency.