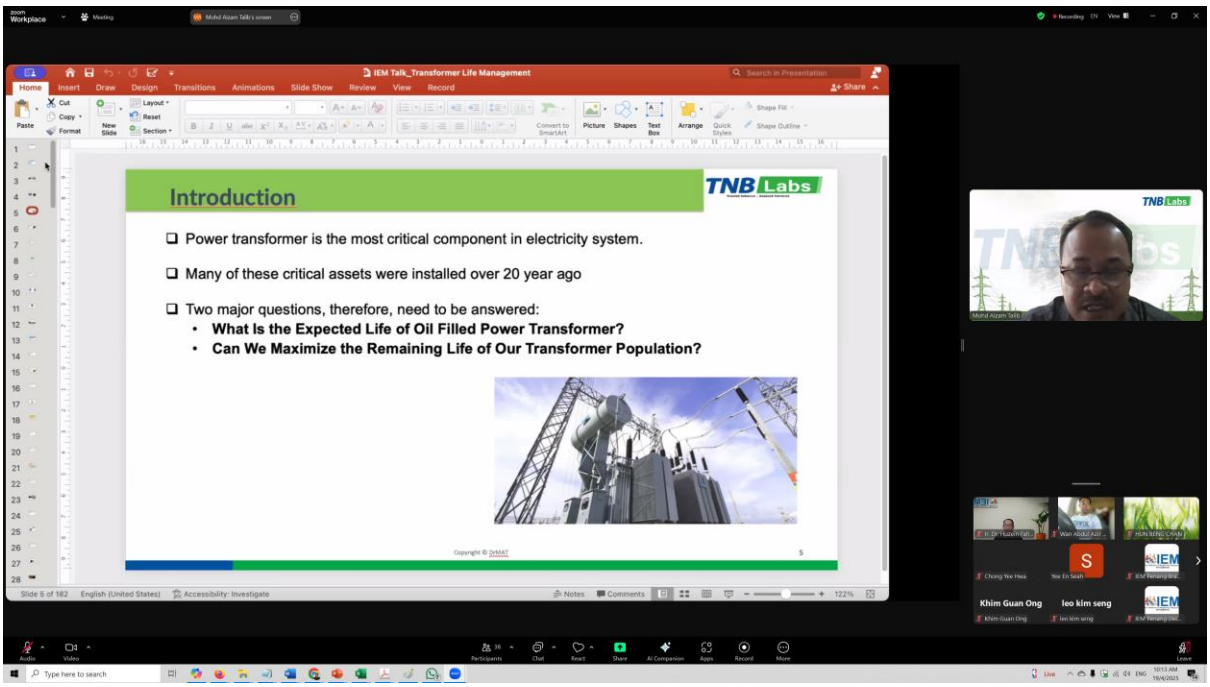
Technical Talk on Life Management of Power Transformers

By
Ir. Dr. Huzein Fahmi Hawari
He is the eETD chairman for 2024/2025.

On Saturday, 19 April 2025, the Electronic Engineering Technical Division (eETD) of The Institution of Engineers, Malaysia (IEM) successfully hosted an online technical talk on the life management of power transformers. The session, which ran from 10:00 AM to 12:00 PM via the Zoom platform, was moderated by Ir. Dr. Huzein Fahmi with a total of 42 registered participants.

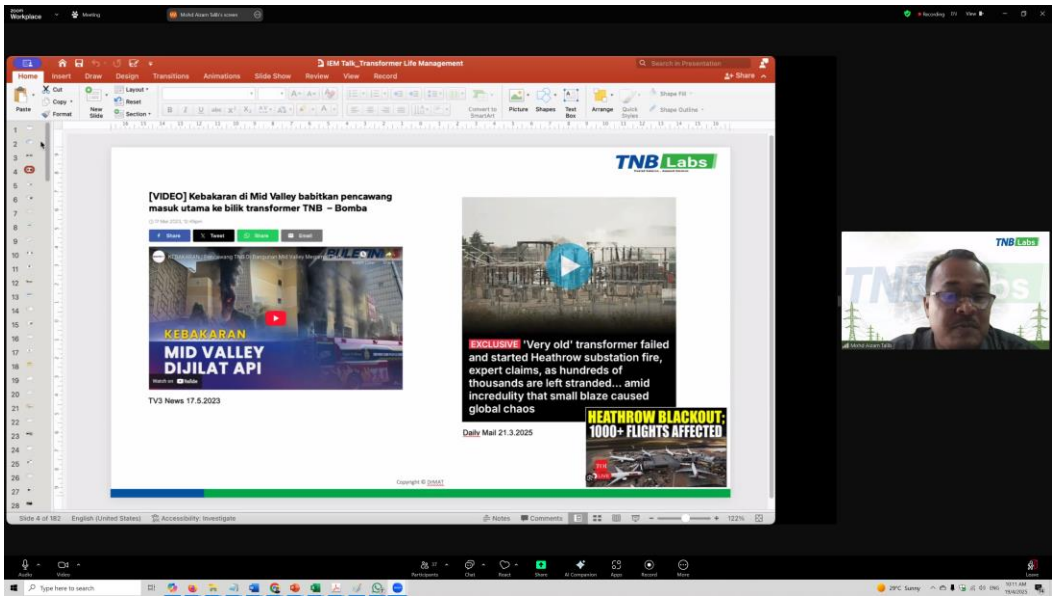


Introduction to power transformers

Ir. Dr. Mohd Aizam Talib opened the presentation by highlighting the vital role that power transformers play in electrical networks, noting that many units in service today have been operating for over two decades and therefore face progressive insulation degradation. He explained that transformer insulation consists of both oil and paper components, each of which

undergoes chemical and thermal aging. Over time, the cellulose structure of the paper breaks down and the transformer oil deteriorates, increasing the risk of internal faults.

Moving seamlessly into diagnostic techniques, Dr. Aizam described how condition assessment is carried out through a combination of oil analysis and electrical testing. He detailed the standard IEC 60422 testing regimen, which classifies oil tests into routine, complementary, and special categories. Key indicators such as moisture content, acidity levels, and furanic compound concentrations allow engineers to estimate the remaining life of the paper insulation. He then outlined both basic electrical measurements—such as winding resistance and turns ratio—and advanced methods like Frequency Response Analysis and Partial Discharge detection, all of which can reveal early signs of structural or dielectric weakness.

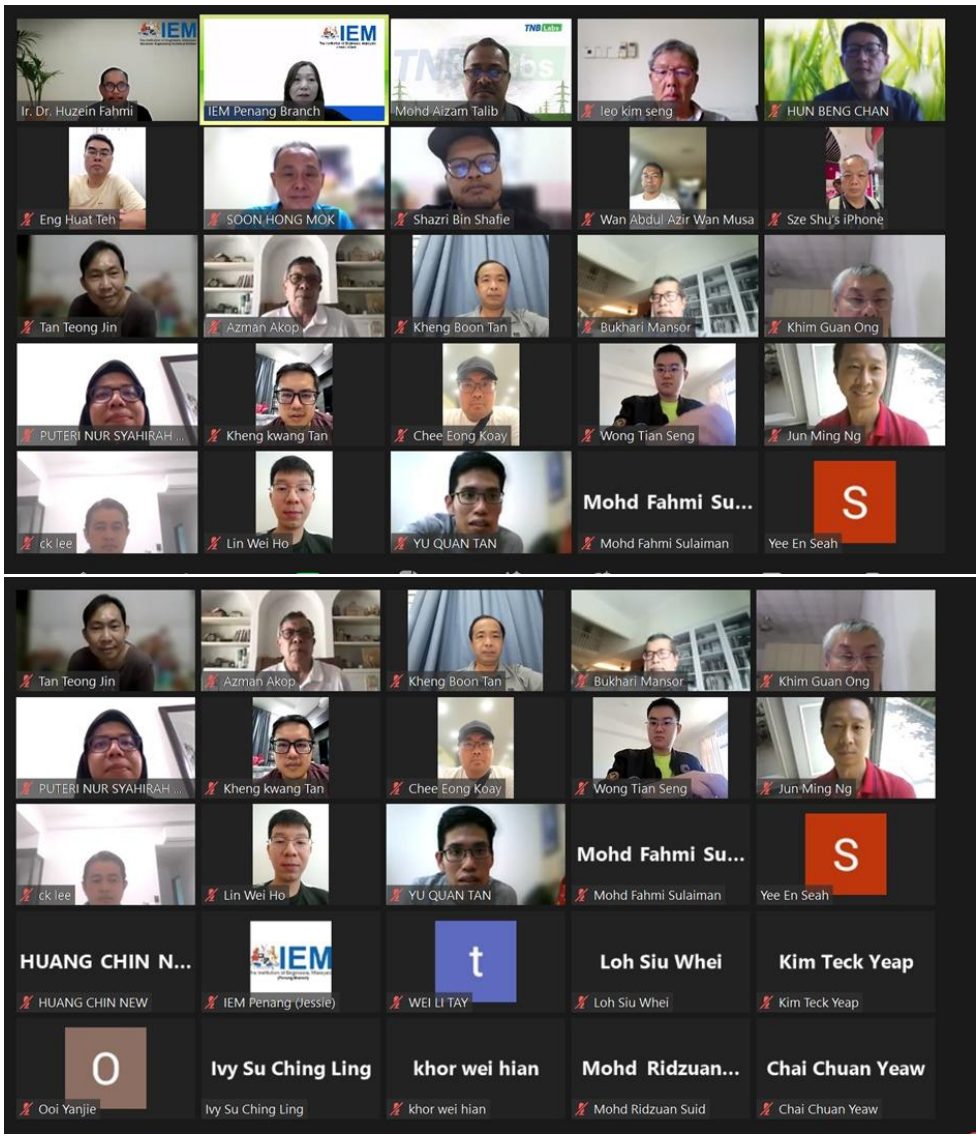


Example of transformer failure

Next, the speaker also compared different maintenance philosophies, contrasting traditional interval-based preventive maintenance with a more proactive, condition-based approach. He argued that real-time monitoring systems enable maintenance teams to intervene before failures occur, thereby extending transformer service life and avoiding costly outages. To manage large fleets of transformers, he introduced the concept of a transformer health index, which aggregates operational data, environmental conditions, and diagnostic results to prioritize maintenance or replacement decisions. He emphasised the importance of combining technical assessments with economic and strategic considerations to determine the optimal end-of-life strategy for each asset.

Throughout the talk, Dr. Aizam illustrated his points with real-world case studies, showing how utilities that adopt integrated diagnostic and monitoring systems have successfully extended transformer lifespans beyond the typical 40–60 years. During the concluding Q&A session, participants engaged in a lively discussion about implementation challenges, including data integration issues and cost–benefit trade-offs.

The session ended with a virtual group photograph at 12:00 PM, marking the conclusion of a highly informative and well-attended event that provided IEM members with actionable insights into transformer life management.



Group photo of the speaker and some of the participants