

IMPROVING TEMBUSU MULTI-UTILITIES COMPLEX (TMUC) COGENERATION PLANT RELIABILITY AND AVAILABILITY THROUGH DIGITALISATION

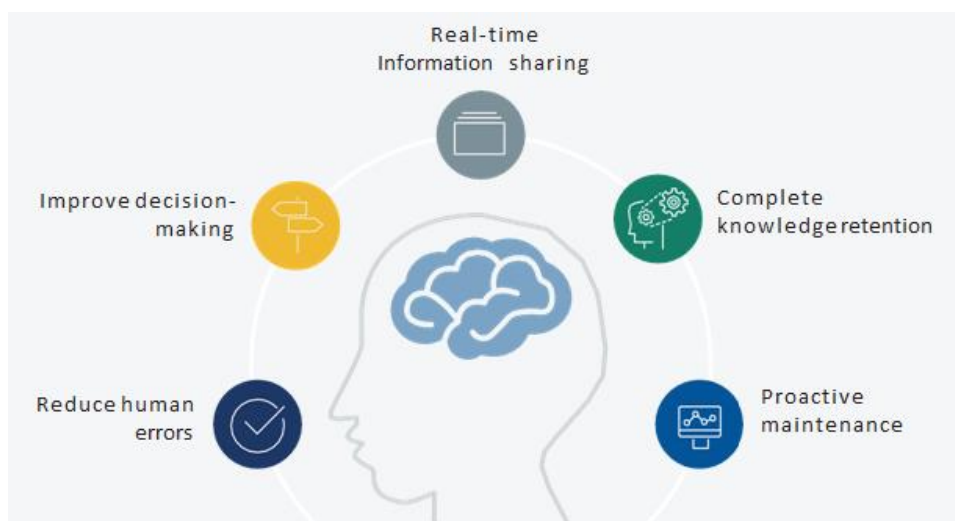


PROJECT SUMMARY

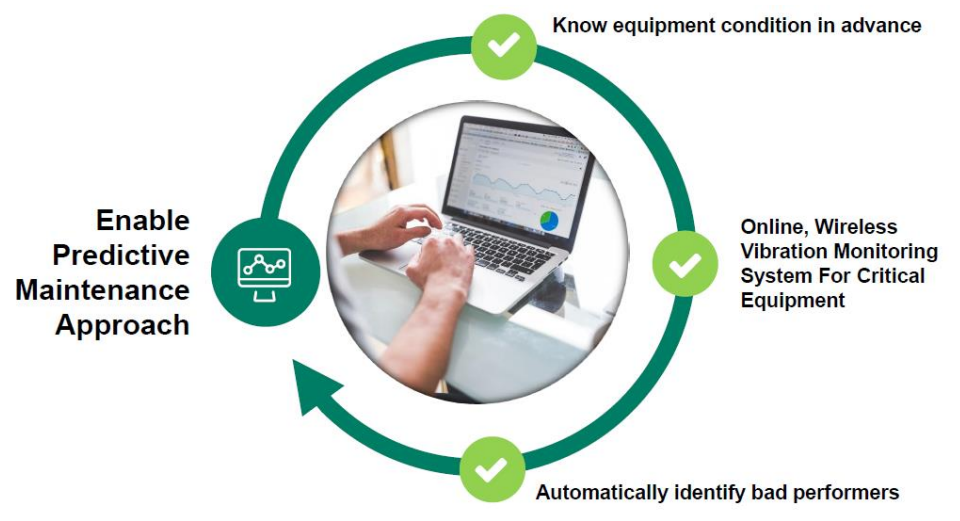
This co-innovation project, a collaboration between Yokogawa Engineering Asia (YEA) & Tuas Power Utilities (TPU), aimed to provide innovative and practical solutions to overcome the technological and manpower challenges at the TMUC cogeneration plant, operated by TPU.

The overall objective of the project was to develop integrated systems leveraging digital technology tools to demonstrate new methodologies and processes to improve human reliability, equipment reliability and overall plant availability:

1. Expert Operation Decision Support System (EODSS) to digitalise plant operations management, and improve reliability and productivity. The EODSS is an intelligent and self-learning procedure automation system built on best practices, electronic Standard Operating Processes (SOP) system, and captures the knowledge of experienced operators.
2. Enhanced Predictive Condition Monitoring System (EPCMS) powered by artificial intelligence and wireless sensing technology to enable predictive maintenance of equipment and reduce plant downtime, without major plant modifications.



EODSS program overview: Human reliability thru electronic SOP system



EPCMS project overview: Equipment reliability thru predictive maintenance

PROJECT OUTCOMES



In 2014, the Energy Market Authority (EMA) awarded the Power Generation Grant Call project to YEA, a global Original Equipment Manufacturer, who partnered with TPU, a Generation Company (Genco) operating in Singapore.

Through the awarded project, YEA and TPU had successfully developed the EODSS and EPCMS solutions, which have enabled TPU to improve its TMUC's human and plant availability levels and achieve cost-savings of over S\$200k. These benefits include digitalising TMUC's operations and shift from an ad-hoc, reactive plant maintenance approach to a predictive plant maintenance approach and allowing TMUC's operators to be freed up for other tasks to achieve higher productivity. Further details of the quantitative benefits can be found in the figure below.

The success of this pioneering research is attributed to the co-innovation between TPU and YEA, commitment from both companies' upper management, and TPU's eventual adoption of the agile processes. This project also showcases the digital transformation at TPU, and highlights examples of best practices innovations that could be employed by the other Gencos to address the common challenges to stay competitive in the market. Moving forward, TPU will explore opportunities to co-innovate with YEA on their digital transformation journey to achieve a more reliable and efficient plant.

Improving Human Reliability and Capability

- Enhance operations and maintenance (O&M) capability
- Best practices / procedures were implemented
- 30% reduction** in number of abnormal events
- 30% reduction** in number of operator's actions
- 80% reduction** in operator's alarm

Outcome of human reliability program

Improving Plant Reliability, Availability, and its KPIs

- 20% reduction** in number of operator/human error
- 20% reduction** in number of equipment outage

Outcome of equipment reliability program

Commitment of TPU & YEA's management teams

PRINCIPAL INVESTIGATOR

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