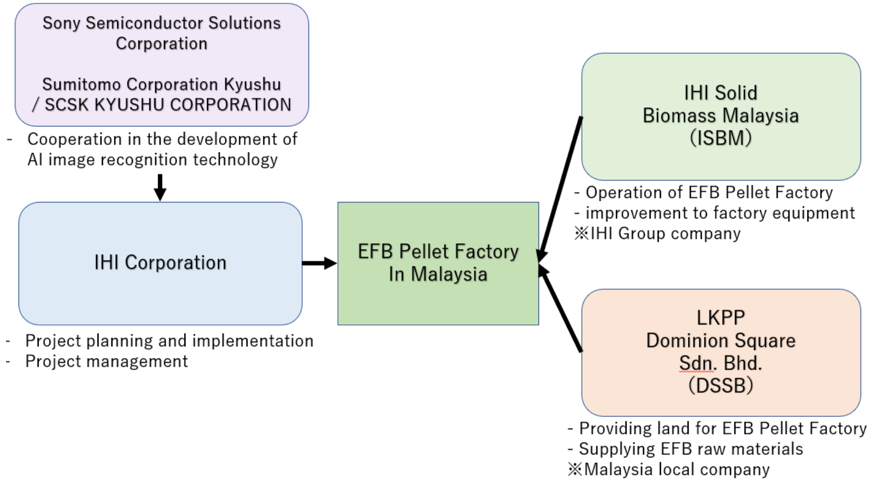
IHI Corporation

Demonstration project of visualizing CO_2 emissions and facility utilization rate, using digital technology for factories in Malaysia

Objective of the project

Reducing greenhouse gases (GHG) is an urgent issue worldwide including in Japan and ASEAN countries. In this project, we visualized the operational status and the amount of GHG emissions generated during the manufacturing stage at EFB (Empty Fruit Bunch) pellet plant and utilized the productivity-improving process and technology, as well as AI image recognition technology. In the future, these technologies can be socially implemented in various industries in Malaysia to improve factory productivity, thereby contributing to GHG reduction across the entire ASEAN region, starting with Malaysia.

Cooperation with local companies/governments



Targeted economic/social issues

Reducing greenhouse gases (GHG) such as CO_2 and CH_4 is an urgent global issue, including in Japan and ASEAN countries. ASEAN nations have signed the Paris Agreement and set the greenhouse gas reduction targets for 2030 as part of their Nationally Determined Contributions (NDC). They also have declared intentions to achieve net-zero GHG emissions between 2050 and 2065, and Malaysia has set the goal of reducing GHG emissions per GDP by 45% compared to 2005 levels by 2030. In Malaysia and Indonesia, the palm industry is thriving but the empty fruit bunches (EFBs), which are residues after extracting oil from palm fruits, have been discarded from palm oil mills to plantations. These dumped EFBs caused emissions of large amounts of methane gas, a GHG, contributing to global warming.

IHI is engaged in a business in Malaysia that involves processing EFBs into pellets at its own factory to produce carbon-neutral fuel for power generation. While some factories in Japan are actively working to reduce CO_2 emissions, such efforts are scarcely implemented in Malaysia, where production tends to be inefficient and environmentally taxing. There has been no previous case of visualizing CO_2 emissions and improving equipment operation rates using digital technology at EFB pellet factories. Therefore, this demonstration project is significantly important.

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Demonstration period

August 2023 – January 2025

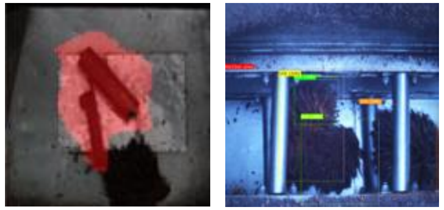
Details of demonstration

This project aims to improve the operational efficiency of equipment at an EFB pellet plant in Malaysia using digital technology, with the goals of reducing CO_2 emissions per unit of EFB pellet production. For this purpose, we visualized CO_2 emissions from the plant and conducted demonstration tests using photoelectric and vibration sensors to monitor EFB accumulation, and developed and tested technologies of counting EFB units and detecting foreign objects based on AI image recognition technology.

The production line of the EFB pellet plant consists of various equipment, including facilities of transportation, shredding and pressing, washing, drying, and pelletizing. Even if some equipment stops, other parts continue to operate, leading to unchanged power consumption for the entire plant and inefficient production from an environmental perspective. Equipment stoppages are often caused by blockages when large amounts of EFBs are fed simultaneously or by failures due to foreign objects like stones and metals mixed in with EFBs. In collaboration with AI development company, Sony Semiconductor Solutions Corporation, Sumitomo Corporation Kyushu, and SCSK KYUSHU CORPORATION, AI image recognition technology was developed to count EFB units and detect foreign objects.

Project outcome/ future plans

The sensors adopted for this project could not demonstrate and achieve the initially planned outcomes, but it was confirmed that the newly developed AI image recognition technology could perform with relatively high accuracy. By using this AI image recognition technology to improve operational efficiency of the plant's equipment and increase EFB pellet production by 1.5 times, it is expected that the plant's CO_2 emissions can be reduced from the current 0.31t-CO_2 (calculated based on plant energy consumption and CO_2 conversion factors) to 0.21t- CO_2.



Examples of Image Recognition
(Counting and Foreign Object Detection)

However, the results obtained from this project are based on short-term tests conducted at the EFB pellet plant. It is necessary to install the image recognition equipment at the plant and modify it to withstand the local network vulnerability and harsh working conditions, ensuring stable recognition of input quantities and foreign objects. Continued collaboration between IHI and ISBM is essential for the full-scale introduction and demonstration of the AI image recognition equipment. If favorable results are achieved during actual operation after its implementation, this AI image recognition technology can be extended to palm oil plant like LKPP Dominion Square and eventually to other palm oil mills and manufacturing plants in Malaysia. This will enhance productivity across the country, contribute to industrial development, and support CO_2 reduction efforts.