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Study for the Project on Super-High Efficiency Small Once-Through Boiler and Promotion of Associated Technologies

New Energy and Industrial Technology Development Organization (NEDO)
Miura Co., Ltd./Tepia Corporation Japan Co., Ltd.
NEDO’s Feasibility Studies with the Aim of Developing a Joint Crediting Mechanism

Thailand/Energy Efficiency

Study for the Project on Super-High Efficiency Small Once-Through Boiler and Promotion of Associated Technologies

Implementing Agencies: Miura Co., Ltd./Tepia Corporation Japan

The project aims to promote super-high efficiency small once-through boiler to the Thailand market, the most industrialized country in the ASEAN region. Bundling multiple boilers as one ‘project-type JCM’ project by using online maintenance system could allow certain amount of credits to be offset, reducing payments for those boilers, while the annual reduction volume of CO₂ per boiler becomes less than 1,000t.

Summary

1) Investigate whether there are any technological obstacles to install the super-high efficiency small one-through boiler in Thailand. The technologies to be included in the system are such as the online maintenance system, pretreating of the feed water, and linking of multi-can control system.

2) Develop and verify the lease scheme with JCM credit, to reduce initial payment of customers.

Survey Items

1) Study effectiveness and marketability of super-high efficiency small one-through boiler by ‘load analysis’ of current smoke-tube boilers at 8 factories.

2) Study the business feasibility in the aspect of product and technology.

3) Establish a methodology and MRV in JCM scheme to validate the lease scheme with JCM credit.

Partner/Site

- Thailand

(Discuss with DEDE and DIW to select 8 enterprises)

Estimated Reduction Amount

975 tCO₂/year (Switching of fuel from Coal to LNG, per project site)

Business as Usual: Low efficiency flue circular tube boiler is being used and due to aging/degradation, the efficiency has become poorer.

Reference scenario: Constant conservative coefficient is added to actual boiler efficiency obtained from measurement for setting a more conservative reference scenario.

Operation/production efficiency can be improved by multiple installation of small once-through boilers and further. By switching fuel to low-carbon fuel, GHG emissions can be reduced.

The operation/production efficiency improvement and energy consumption can be monitored online.

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<th>CO₂ emissions</th>
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<td>LPG</td>
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<td>LNG</td>
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<td>Diesel</td>
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<td>Fuel oil</td>
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<td>Coal</td>
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BaU • Reference scenario

Carbon dioxide emission reduction

Project scenario

Estimated Reduction Amount about 44%
Reduction Volume: 975 tCO₂/year (Switching of fuel from Coal to LNG, per project site)
Reduction Volume: 475,526 tCO₂ (Dissemination of 1075 boilers by 2019)
The features of this boiler is ‘energy-saving’ and ‘low environmental impact’. It achieves 98% boiler efficiency by itself by using automatic control with microcomputer technology, adopting structure of a can body that has higher heat transfer performance, installing low-level NOx burner and so on. It also reduces 40% of electricity consumption by using inverter control for the fan. Moreover, the boiler is extremely high safety because of holding less water volume.

*Non-furnace can body structure and technology of large pre-mixing burner

In general, thermal NOx will be increased according to miniaturising the body and increasing output of the boiler which leads to an increase in generation rate of combustion heat (calorific capacity of combustion chamber). However, we have achieved the improvement of heat transfer performance and low NOx with the method of running both the combustion reaction and the heat transmission in the space of a boiler water tube group at the same time, by using a square non-furnace can body with no combustion chamber, combined with a large pre-mixing burner.

*Technology of latent heat recovery by economiser

Economisers used to be set up for the purpose of heat recovery of exhaust gas from a boiler. However, we have achieved high efficiency of boilers, because the latest type of economisers which are incorporated in super-high efficiency boilers have enabled heat recovery from the vapor of exhaust gas, by improving its heat exchanging capacity and optimizing its materials.

*Technology of microcomputer control

Super-high efficiency boiler is working for further improvement of efficiency and safety of boilers. As an alternative to the previous method of relay sequence to control the boiler, we have incorporated the method of microcomputer that enables advanced control of the boiler.
Prevention and Maintenance by Online System

The system is capable of detecting a problem in advance, and performing maintenance by monitoring the data of a boiler at a client's site, for example, running hours, exhaust-gas temperature, vapor content, condition of adherence to the scale and so on. Carrying out this preventive maintenance system also plays an important role to keep certain efficiency, because the efficiency of the boilers usually changes by the scale, or increase of blow rate and so on. We plan to utilize this online maintenance network for the online monitoring of JCM as well.

Multi-Can Linking System with Eco-Running Point

We expect sufficient energy-saving effect by saving the working number of the machines during low loading time. Small boilers will be set up as a method of multi-can to control the capacity, instead of setting up a large capacity boiler.

Normal type of boiler systems tends to run longer during low load factor, since the capacity was set to fulfill the maximum steam load, and spare boilers are prepared aside from a main boiler. In order to improve actual running efficiency of boilers, we need to increase the efficiency of the whole system by not only increasing efficiency, but also minimizing the running efficiency during low load factor. Super-high efficiency boiler system is able to achieve high running efficiency of the whole system by combining "number control of machines with eco-running point priority" which controls the number of operating machines by giving priority to eco-running points.