The Paradigm shift of Real time boiler maintenance for zero breakdown and Energy management of low carbon emission Steam Systems
Presentation Overview;

- Company Business Principle
- MIURA Boiler in Global impact
- MIURA Boiler in Thailand market
- Environmental Technology of Small Once-Through Boilers
- Maintenance Online real time boiler system
- The Paradigm shift of Real time boiler maintenance for zero breakdown and Energy management of low carbon emission Steam Systems
Company Sustainable Business Principles;

We will contribute to creating a society that is environmentally friendly and ways of living that are clean and comfortable through our work in the field of the Energy, Water, and Environment.

1. Create and Challenge
2. Trust and Communication
3. Fairness and Justice

To create an inspiring workplace where we can take pride in our work.

1. Encourage globalization with the Group's total strength.
2. Create “Best Partner” relationships with customers all over the world through “Technoservices”.
3. Create a workplace where employees can maximize their abilities.
Global Boiler Sales: 143,000 Units (~12,000,000 BHP)
- Asia ~ 140,500
- North America ~ 2,500

180 Million Metric Tons of Annual CO2 Reductions
500 Trillion Btu Annual Energy Savings Worldwide
Features of each boiler

**Fire tube boiler**
- Efficiency: 85–92%
- Able to generate a large amount of steam at once.

**Water tube boiler**
- Efficiency: 88–92%
- Able to generate a large amount of high pressure steam.

**Once-through boiler**
- Efficiency: 95–98%
- It can correspond in various industries by multiple installation system.
Feasibility study for the Project carbon reduce for promote Once-Through Boiler in Thailand Market

**Estimated Reduction Amount • Measurement Method**

- **Industrial Sector:** 12,481 Units
  (Department of industrial work)
- **Hotel, Hospital sector:** 4,126 Units
  (Estimate from number of hospital and hotel)

**Estimated Reduction Amount**

- **About 44%**
- **Reduction Volume:** 975 ton-CO2/year
  (Switching of fuel from Coal to LNG, per project site)

**Reduction Volume:** 475,526 ton-CO2 (Dissemination of 1075 boilers by 2019)
Features of MIURA Once-Through Boiler

<Boiler microcomputer control>

- Self-diagnosis function
- Notice function
- Heat data management function
- Communications function

- Green
- Red
- Green & Yellow

- Normal
- Error
- Notice

Prevent boilers from stopping

All 39 items including:
- flame sensor degradation
- insufficient feed water
- scale buildup
- blow timing
- pump capacity loss
- fault of water level electrode(s)
- insufficient air volume
- backflow

Flue gas temperature
Average daily temperature of flue gas is displayed. This data can be used for heat management.

Boiler overheat thermostat
Backs up the boiler in the event of an abnormally high temperature.

Boiler operation hour
Low fire time and high fire time are added together to check load condition. This data can be used for heat management.

Boiler efficiency
Average daily efficiency is displayed. This data can be used for heat management.

Evaporation amount
Daily evaporation amount is displayed. This data can be used for heat management.
NOx reduction with low-temperature combustion system and energy saving by low air ratio combustion (gas fired boiler)

Image of flame from “non-furnace pressure vessel”

Analysis of gas and air mixing analysis in wind box

Maximum boiler efficiency of 98%*

High efficiency is realized by the unique structure of non-furnace boiler.
Efficiency increased up to 98% by adopting the economizer which has excellent corrosion resistance.

Hyper-low NOx emissions of 25 ppm*

The boiler is realized to the high-level low-NOx by using the unique system of low temperature combustion and combustion technique.
NOx reduction with low-temperature combustion system and energy savings by low air ratio combustion (gas fired boiler)

NOx value is reduced by 70%.

Combustion: Natural gas
Combustion stage: High fire

25% NOx value is reduced by 70%.
What is required for energy savings of a steam system?

- Introducing highly efficient boilers
- Retaining efficiency with maintenance
Non-efficiency Maintenance effect with cost expense and Emission

- 20°C rise in flue gas temperature reduces efficiency by 1%.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Annual fuel cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>With a soot buildup of 0.1 mm,</td>
<td>Up 1.35 million THB</td>
</tr>
<tr>
<td>100°C rise in flue gas temp.</td>
<td></td>
</tr>
<tr>
<td>With a scale buildup of 1 mm,</td>
<td>Up 270,000 THB</td>
</tr>
<tr>
<td>20°C rise in flue gas temp.</td>
<td></td>
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</tbody>
</table>

- Reduced efficiency due to increased blowdown amount

<table>
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<th>Condition</th>
<th>Annual fuel cost</th>
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</thead>
<tbody>
<tr>
<td>If blowdown rate increases by 5%,</td>
<td>Up 270,000 THB</td>
</tr>
<tr>
<td>about 1% reduction in efficiency</td>
<td></td>
</tr>
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★ Calculation condition
Steam consumption: 5 tons/hour (15,000 t/year)
Operation hours and days: 10 hours/day, 300 days/year
Fuel used: Japanese A-type fuel oil (80 yen/L), Fuel cost: 90 million yen/year
Online-Maintenance Overview

Monthly data collection
(NTT/PHS/Cell-phone line)

Customer

Maintenance office

Service engineer

Monthly report

Steam output
Fuel
Consumption
Scale buildup
Implement “IoT” for Maintenance for 29 years

Remote monitoring

Troubleshooting via Telephone (Data collection/analysis)

Approx. 65,000 units under contract *including equipment other than boiler (As of March 2020)

Much more effective, easier maintenance work
ZMP contract

History
1972: Fee-based maintenance contract started
1989: Online maintenance started
1997: In-house qualification system introduced
2002: BP (best partner) strategy
2009: Second ZIS Online Center established
2010: ICT-Utilization Year One (strategic data utilization)
2014: Unique disaster assistance tool developed
2018: More than 60,000 units in communication

Our preventive maintenance transformed conventional after-sale service!

Contract period
- Update every 3 years
- 5 terms (15 years)

- 3 time inspections per year
  - Free parts replacement

- Remedy for sudden troubles
  - Free parts replacement

Anomaly perception

Trouble factor check in advance

Water analysis + Online maintenance

Safety & Swift recovery

Added value

Maintenance revolution
- Preventive maintenance based on operation conditions saves energy and labor costs, and increases products’ life, enabling low-carbon emission.
- Utilizing ICT, we have been rationalizing maintenance work and anticipating countermeasures against disasters.

Solution business development
Energy information management function using cloud Low cost energy management system to establish and improve factory total solution business model, without other management unit
Wearable Camera Service

MR (Mixed Reality) Technology Utilization

IoT/AR/Remote service

MIURA

To remove the cause of the alarm, check that part!

User

Wearable camera

I see!

New worker

Knowledge and technique inheritance

Senior worker

Maintenance support
1. Once-through boiler is high efficiency, eco-friendly, and high level of safety. It is used as the standard boiler in Japan.

2. MIURA Eco-friendly impact to reduce 180 million Metric Tons of Annual CO2 and 500 Trillion Btu Annual Energy Saving worldwide.

3. Feasibility study for switching convention boiler to MIURA Once-through and switching of fuel from coal to LNG, estimated reduce amount about 44% reduction volume 975 ton CO2 per year.

4. We highly recommend to install the once-through boiler for environmental improvement in Thailand. We would appreciate it if you could support a preferential treatment policies of clean fuel use of LNG or light oil.
Questions:

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