The 11th NEDO-CDTI Joint Workshop

"Technologies for Hydrogen Valley in Spain and Japan – Regional H2 Value Chain"

Carbon-Neutral and Hydrogen-fired Boiler

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Hydrogen and FC system Promotion Section

MIURA CO.,LTD.

MIURA

NEDO GOBIERNO DE ESPAÑA MINISTERIO DE CIENCIA E INNOVACIÓN CDTI INNOVACIÓN CO_2 FREE FUEL H_2YES Yamanashi Hydrogen Energy Society AeH2 ASOCIACIÓN ESPAÑOLA DEL HIDRÓGENO

Company Profile

MIURA

Company name	MIURA CO.,LTD.
Location	7 Horie, Matsuyama, Ehime, Japan
Established	May 1959
Capital	9,544 million yen * As of March 31, 2021
MIURA Group (including MIURA CO.,LTD.)	10 companies in Japan, 17 companies overseas * As of March 31, 2021
Business	Production, sale, and maintenance of small once-through boilers, auxiliary marine boilers, exhaust gas (waste heat) boilers, water treatment equipment, food equipment, sterilizers, chemicals, etc., and environmental measurement certification
Revenue (Consolidated)	143,543 million Yen
Operating Profit (Consolidated)	19,441 million Yen

Steam Boiler business

MIURA share in Japan 46.8%

＊excludes power generation application
＊March 2021

No.1 share in Steam Boiler Market in Japan！


Brewing


Food Process


Chemical

Application：drying, distillation, sterilization etc

Steam is the important heat medium in many industries!

Aiming to be Carbon-Free

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Reduction goals

Excerpted from the INDCs submitted to the UNFCCC

Country	Target	
China	**60–65%** reduction of CO_2 emission per GDP by **2030** *Peak CO_2 emissions around 2030	Comparison to 2005
EU	**40%** reduction by **2030**	Comparison to 1990
India	**33–35%** reduction of CO_2 emission per GDP by **2030**	Comparison to 2005
Japan	**26%** reduction by **2030** *25.4% reduction from FY2005 levels	Comparison to FY2013
Russia	**70–75%** of 1990 levels by **2030**	Comparison to 1990
US	**26–28%** reduction by **2025**	Comparison to 2005

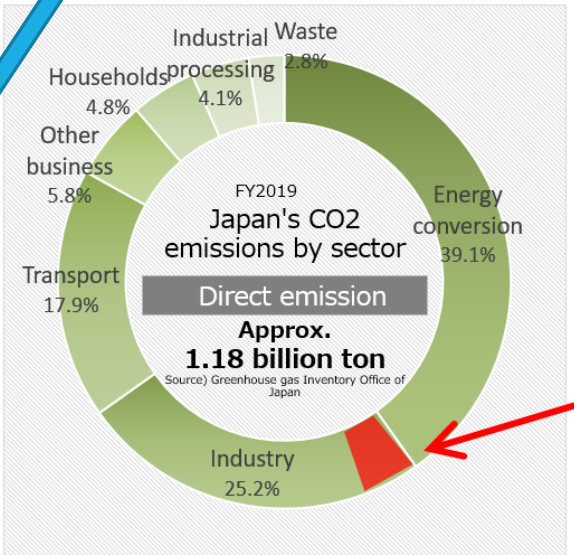
Paris Agreement **2016** October 1, 2015

Oct. 26, 2020 PM Suga's policy speech

Greenhouse gas (GHG) emissions to be cut to net zero by 2050

46% reduction by **2030**

Comparison to FY2013



*MIURA's own research

CO_2 emission from boilers:

Approx. **3~4%** of Japan

Approx. **12%** of industrial sector

Recreated from the data retrieved from the Japan Center for Climate Change Actions (http://www.jccca.org/)

Safety of small once-through boilers

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Steam Boiler

Once-Through Boiler

Fire Tube Boiler

Water Tube Boiler

	Once-through boiler	Fire-tube boiler
Rated Boiler efficiency	～98%	～90%
Boiler Size	Compact	Large
Water capacity	Low（about 120 L）	High（about 2500 L）
Start-up time	Short（about 5 min）	Long（about 50 min）
Radiation heat loss	Low	High

Energy saving	High	>
Safety	High	>

Source：Maker website (Lotus Boilers, Yoshimine)

- Once-through boilers showing a very low accident rate
- In Japan, the legal regulations and handling qualifications are relaxed for once-through boiler

Trend in the number of boiler accidents in Japan

Year	Boiler		Small boiler		Simple boiler	
	Accidents	Dead and injured	Accidents	Dead and injured	Accidents	Dead and injured
2017	2	2 (0)				
2016	4	1 (1)				
2015	2					
2014	3	3 (0)				
2013	2	1 (0)				
2012	5	3 (1)				
2011	2	2 (1)				
2010	1	2 (0)	1	0		
2009	3					
2008	2	1 (1)				
2007	4					
2006	2	2 (2)				
2005	3					
2004	3	3 (1)				
2003	5					
2002	2	3 (3)				
2001	2					
2000	5	1				
合計	52	24 (10)	1	0	0	0

- In Japan, most of once through boiler with steam pressure below 1MPa (=10 bar or 145psi) are categorized as “small boiler” or “simple boiler.”
- Few accidents and no death with “small boiler” and “simple boiler”

Features of Hydrogen-Fired Boiler

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Carbon dioxide emission per steam （t）
(20°C feed water at 0.7 MPa, based on MIURA's test calculation)

Steam (heat source for food processing, chemical, machinery, cleaning, etc.)

Coal

355 kg-CO_2 /Steam (t)

A type fuel oil

243 kg-CO_2 /Steam (t)

Natural gas

161 kg-CO_2 /Steam (t)

Hydrogen

0 kg-CO_2/Steam (t)

Gas-fired once-through steam boiler

Hydrogen-fired once-through steam boiler: SI-2000AS

Use of natural gas
▲82kg-CO2/Steam ton

Use of hydrogen fuel
▲161kg-CO2/Steam ton

→Large CO_2 reduction impact

Since the only by-product of hydrogen combustion is water, CO_2 emissions during combustion are zero!

Hydrogen-fired Boiler Lineup (Only in Japan)

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(Once-through boiler)

	SU-250H	SI-2000AS	AI-2500 16S/20S
Equivalent output	250 kg/h	2,000 kg/h	2,500 kg/h
Heat output	157 kW	1,254 kW	1,568 kW
Boiler type	Simple boiler	Small boiler	Boiler
Requirements for operators	None	Participation in special training by the employer	Completion of the skill training course for operation of boiler
Utility required	Nitrogen for purges	Nitrogen for purges	Nitrogen for purges
Additional safety device	Flame arrestor	Flame arrestor	Flame arrestor
Max. working pressure	0.98 MPa	0.98 MPa	1.57/1.96 MPa
Hydrogen consumption*1	58.2 Nm3/h	451.8 Nm3/h	576.8 Nm3/h
CO_2 reduction Capacity*2	Approx. 300 t/year	Approx. 2,200 t/year	Approx. 2,900 t/year
Appearance			

*1: Option: High efficient Boilers
*2: CO_2 emissions from a city-gas fired boiler of the same capacity

Low NOx Specification

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Low NOx Specification

The first hydrogen-fired boiler certified as the Tokyo ultra-low NOx equipment

SI-2000AS-H2A

NOx=Less than 50 ppm (O_2=0% conversion)

新規開発の低NOxバーナを搭載した水素燃料ボイラが 全国初！東京都低NOx・低CO2小規模燃焼機器に認定決定

2021/05/26 ニュースリリース

産業用ボイラのトップメーカーである三浦工業株式会社(本社：愛媛県松山市、代表取締役：宮内大介)は、水素燃料ボイラの低NOx仕様のバーナ開発にかねてより取り組んでまいりました。今回開発した低NO x バーナを搭載した水素燃料貫流ボイラ（SI-2000AS-H2A）が、全国の自治体で初めて水素燃料を使用する蒸気ボイラとして2021年5月21日に開催された「東京都低NO x ・低CO_2小規模燃焼機器委員会」※1の認定審査を受け、新たな認定区分（グレードH）※2として認定されました。

From our news release→

Carbon-Neutral and Hydrogen-Fired Boiler

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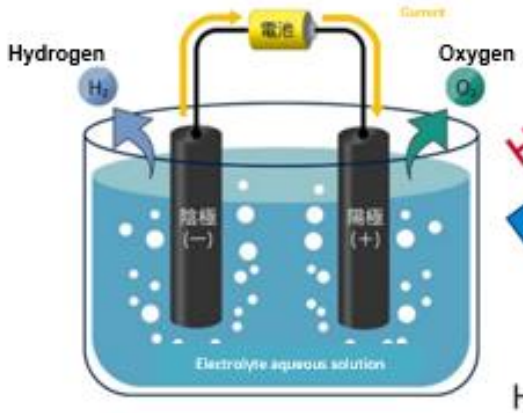
Hydrogen can be generated from various primary energy sources

Although present hydrogen-fired boilers mainly use by-product hydrogen as fuel because of costs, demonstrations using renewable energy-derived hydrogen have already started.

Mechanism of water electrolysis



$H_2O \rightarrow O_2 + H_2$

Water electrolysis using renewable energy

By-product hydrogen from soda manufacturing

$2NaCl + 2H_2O \rightarrow 2NaOH + Cl_2 + H_2$

By-product gas produced at a factory