CEFIA Flagship:

Ammonia Combustion in Industrial Furnaces : Challenges and Implementation

13th Feb 2026

ChugaiRo Co.,Ltd.
Research & Development and GX-Project Dept.
Rina Ohkura

About us (Chugai Ro)

● Sakai Works
(Area : 51,960㎡)
・Engineering Center
・Assembling Factory
・Research Center

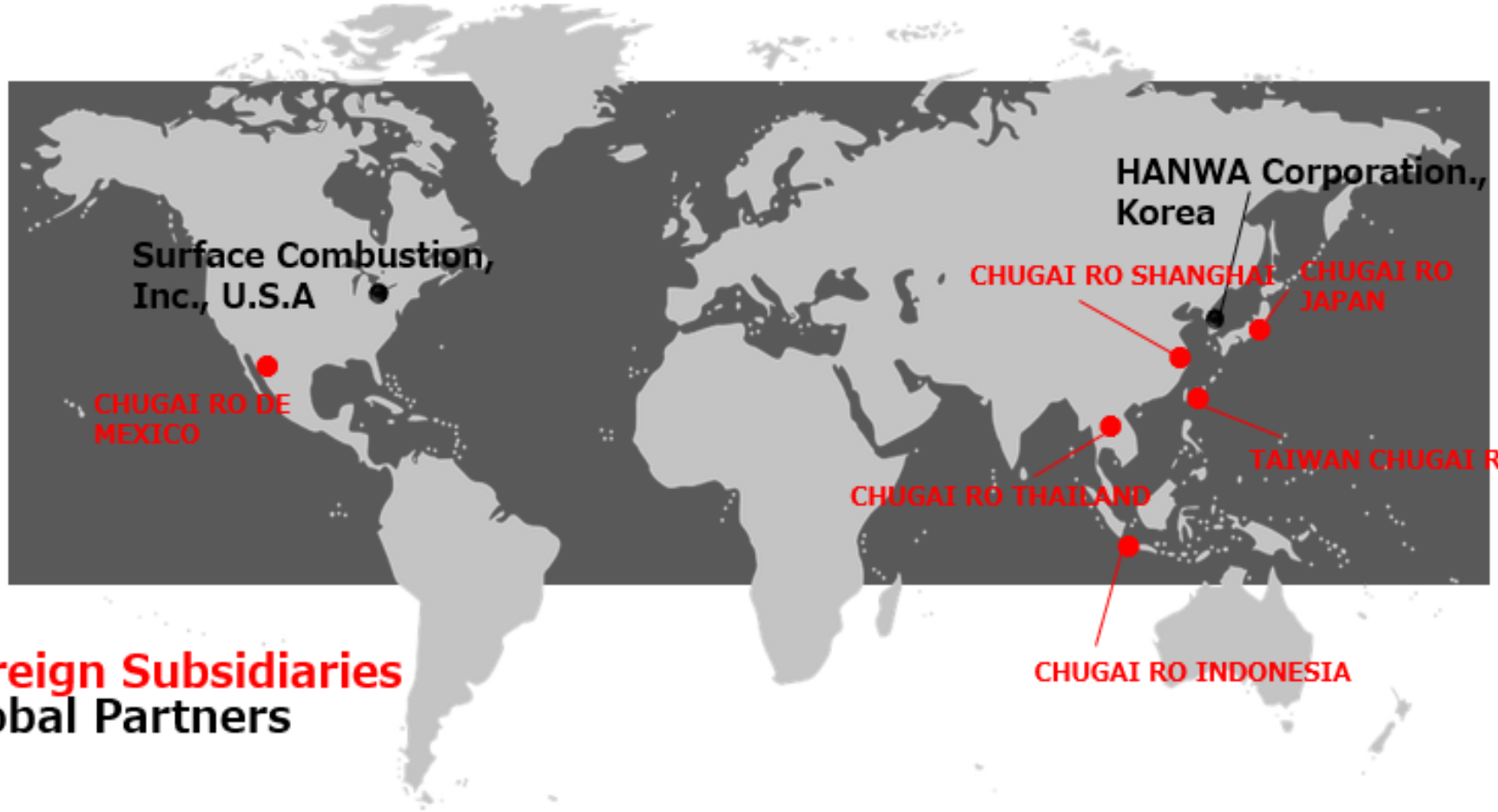
Head office : Osaka city JAPAN
Fund : April 1945
Capital : 6.18 billion
Employees : 482(Group 723)

● Other Domestic : Kokura factory, Nagoya, Tokyo

ZERO EMISSIONS CHALLENGE

Carbon neutral, DX, Pursuing greater innovation to create new value.

About us (Chugai Ro)

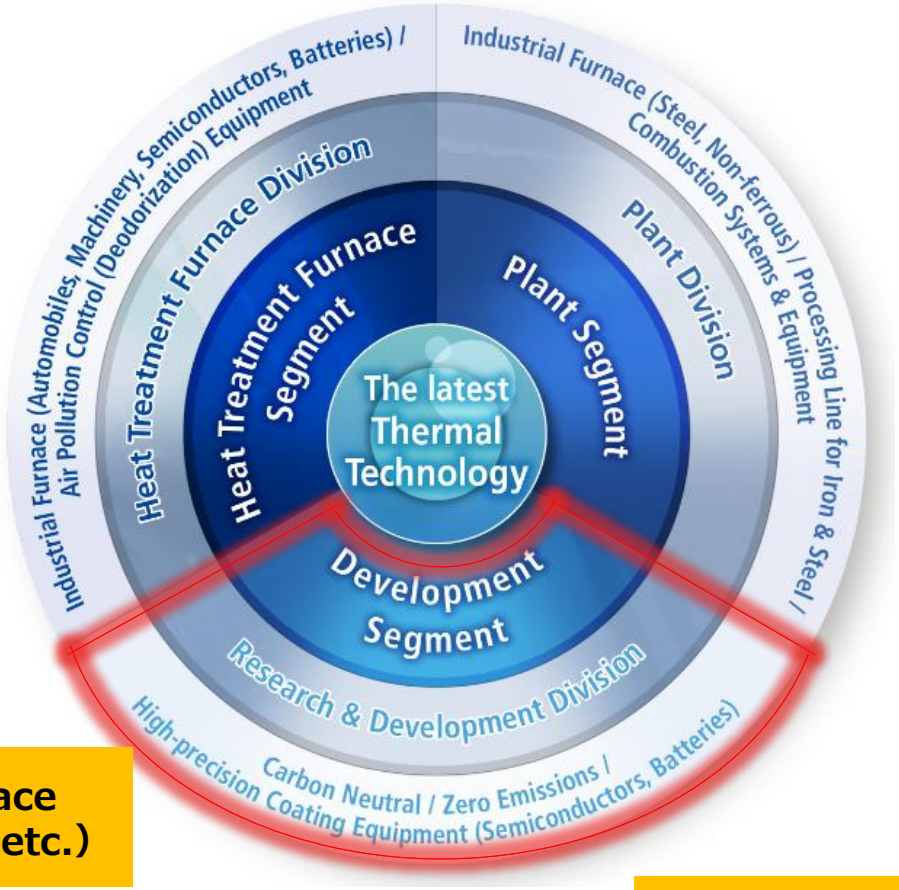


Global presence in more than 56 countries

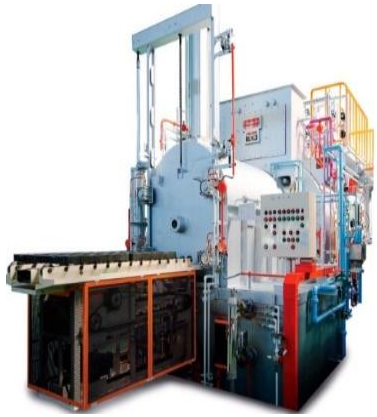
Business Activities (Chugai Ro)

We aim to be a technology-driven company that brings together next-generation thermal technologies and creates a prosperous future for people and the planet.

Rotary Regenerative Thermal Oxidizer



Reheating Furnace for Steel/Nonferrous



Heat Treatment Furnace (Carburizing、Sintering etc.)

High-precision Coating Equipment

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Topics of Research & Development

"Thermal Technology Innovation Center," a New Base for Decarbonization, Opening November 2023

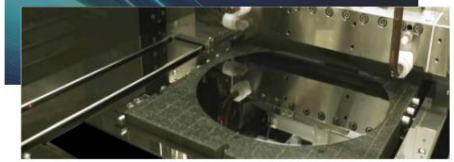
❶ Thermal Technology Creative Center

❷ Zero Emission Technology Laboratory

❸ Vacuum Carburizing Technology Laboratory

❹ Metal Heat Treatment Technology Laboratory

❺ Converting Technology Laboratory



Through the integration of research and development facilities, the laboratory has evolved into an innovation hub.

The world leading thermal technology now enters the next phase.

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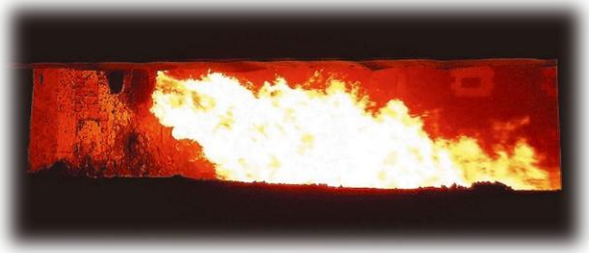
What is an industrial furnace?

An industrial furnace is a general term for heating and cooling equipment used to change the physical, chemical, and mechanical properties of materials and parts by heating and cooling, primarily in the steel, automotive, electrical, electronics, ceramics, chemical, and environmental industries.

Purpose of heating and cooling treatment



- To make soft metals hard.
- To make hard metals soft.
- To make brittle metals tough.
- To form a thin oxide film on the metal surface.
- To join metals together.
- To make the metal surface more slippery.
- To make the metal surface more resistant to wear.
- To improve strength at high temperatures.
- To make metals more resistant to corrosion.

...

Industrial demand is primarily in the 800–1300°C range.

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Products manufactured in industrial furnaces

Steel materials (steel plates, pipes, wire rods, etc.)
Automobile, railway, and aircraft components
Display panels (televisions, smartphones, etc.)
Solar cells, lithium-ion batteries
Home appliances such as refrigerators and air conditioners
Tennis rackets, golf clubs, fishing rods
Window glass, window glass, sashes , coins
Cosmetics (foundations)
etc...

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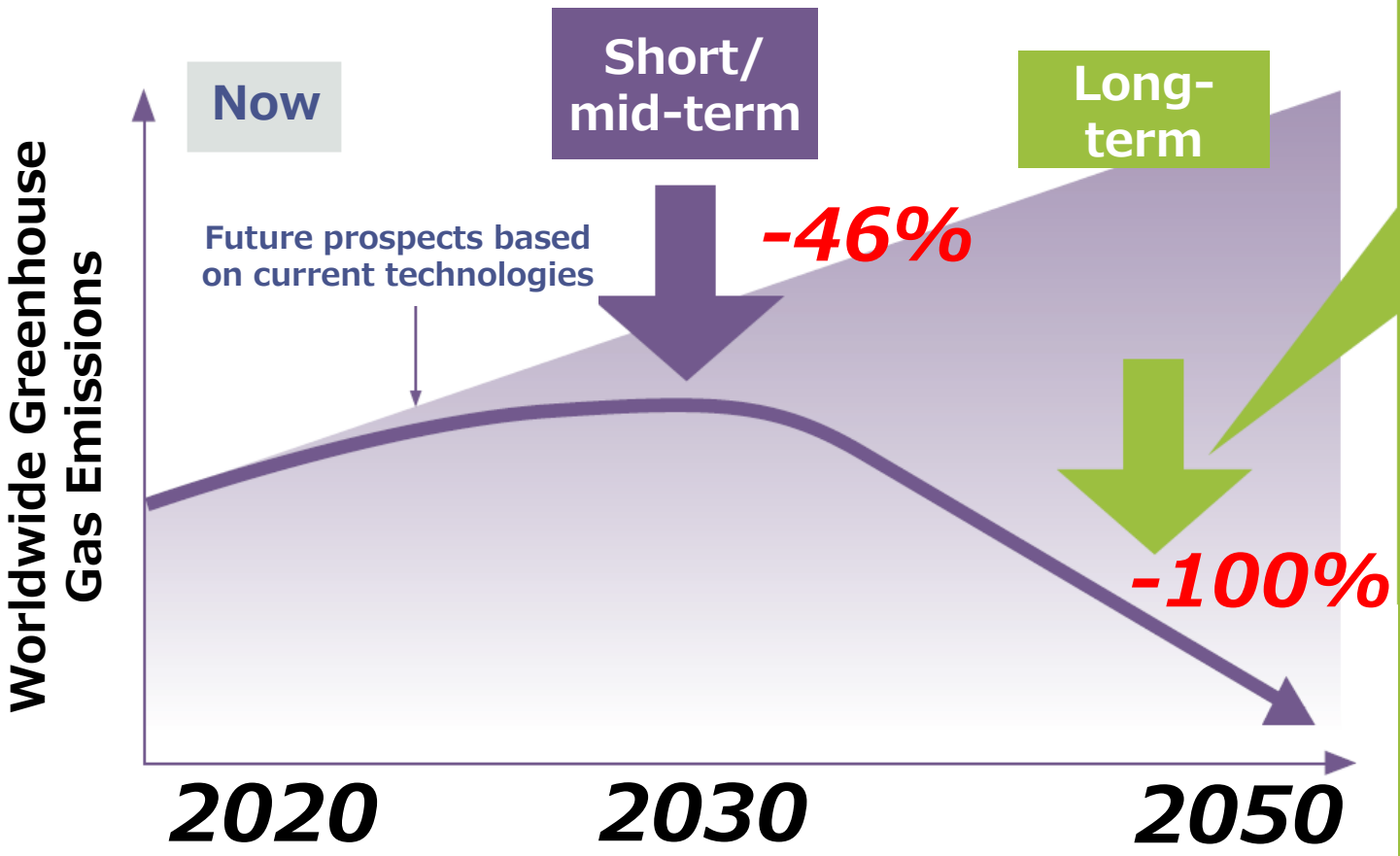
The needs for decarbonization will continue to increase (Japan)

*Rate of reduction is compared with 2013



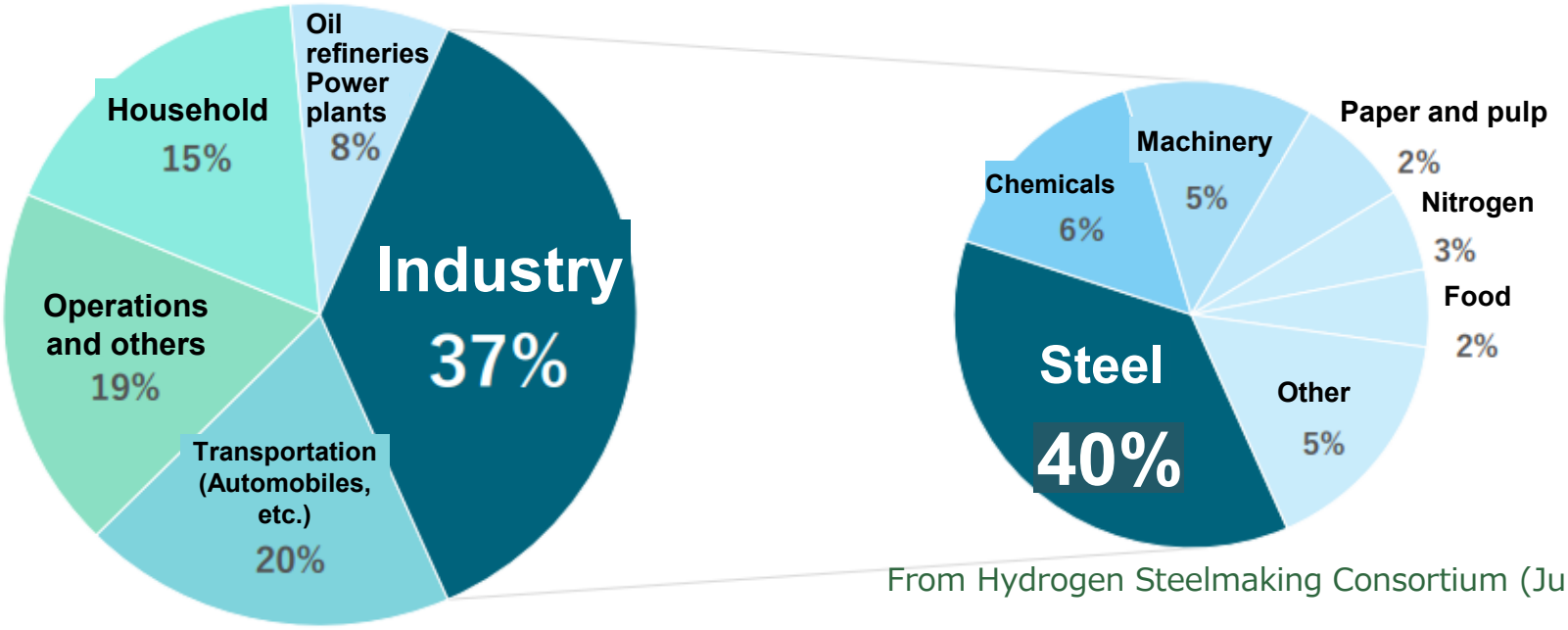
Innovative Technologies

In addition to the existing technologies, breakthrough core technologies are essential in efforts to drastically reduce GHG emissions in the long term.

Source: Partial adaptation of The Commitment to a Low Carbon Society by Keidanren

The importance of decarbonizing industrial furnaces for steel

Of the total CO2 emissions from Japan, **37%** of CO2 emissions are from the industrial sector. The **steel** industry in particular accounts for **40%** of industrial sector CO2 emissions (**14**% of national CO2 emissions), so the reduction of steel industry CO2 emissions is an urgent task.



From Hydrogen Steelmaking Consortium (June 2022)

Overall
1.03 billion tons/year

0.15 billion tons/year

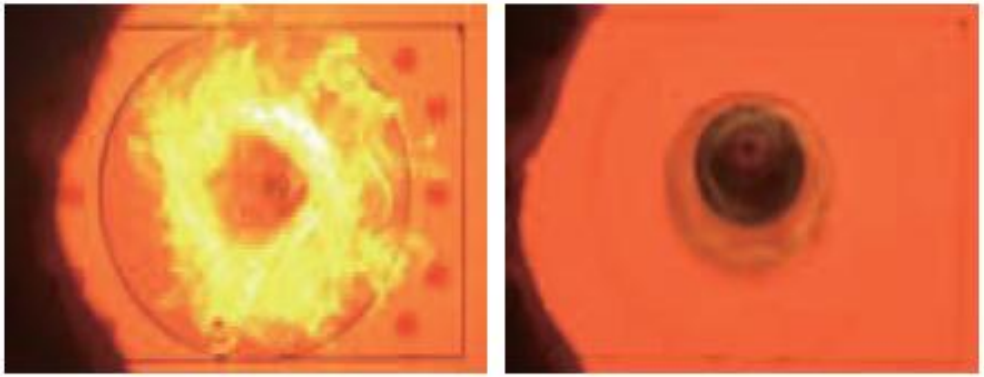
As a company that has delivered many industrial furnaces for steel, this is also an important target for us.

Development of Decarbonizing Industrial Furnaces through Innovative Ammonia Combustion

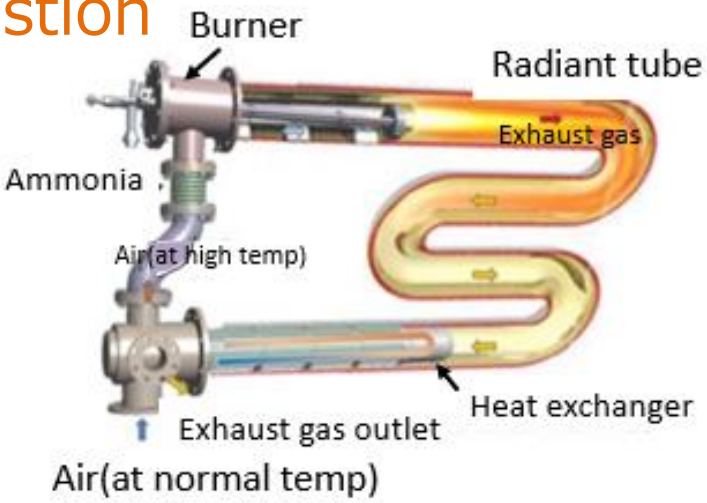
(Osaka university, Chugai Ro Co., Ltd, Tokyo university)

Identification and Arrangement of Issues for Social Implementation

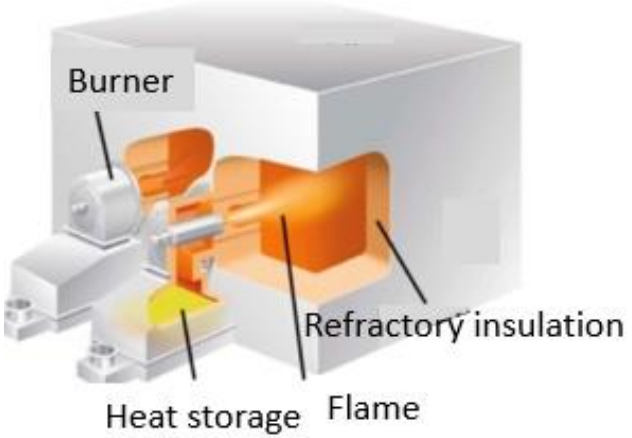
- Various combustion simulations、numerical analyses
- Investigation of the effects on furnace structural materials and heated objects
- Performance evaluation via combustion testing using Radiant tube burner and Regenerative burner



in 100 kW-Class Combustion Test Furnace
natural gas(13A) flame (left) and ammonia flame (right)



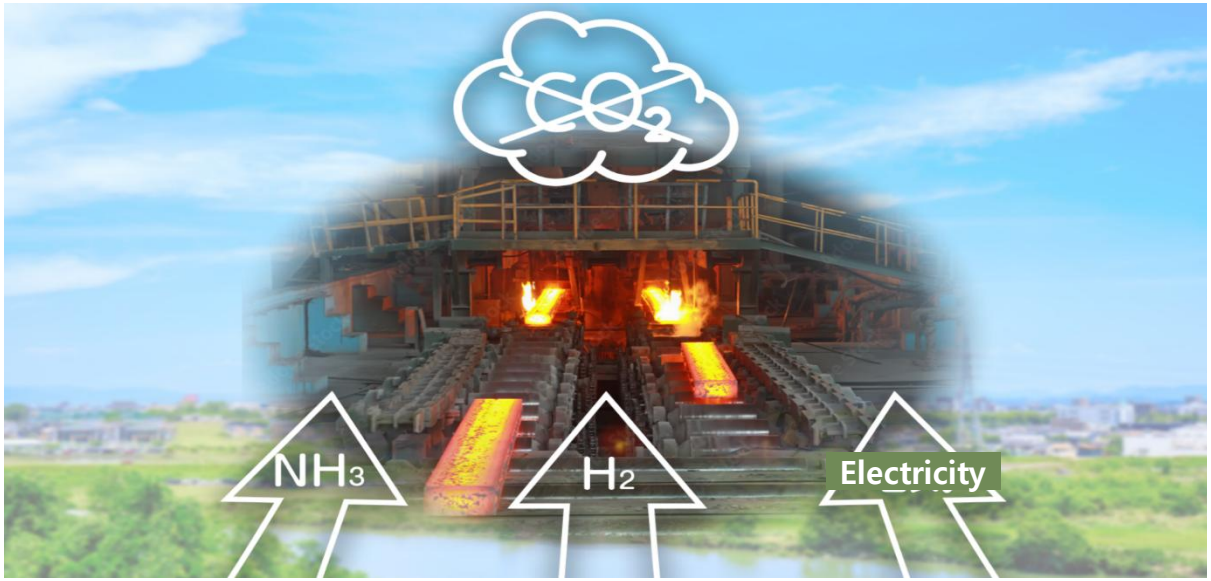
Radiant tube burner



Regenerative burner

NEDO's Green Innovation Project

Anticipating future zero-emission fuel infrastructure, we are developing combustion furnaces for ammonia and hydrogen, and electric furnaces with higher efficiency and lower power requirements



■ Budget *In project overall

Approx. **$224** million

■ CO_2 Reduction Effect (Potential estimate)

2040 Approx. **20** million tons/year (Japan)

2050 Approx. **80** million tons/year (Japan)

■ Economic Effect
(Global market scale estimate)

Total up to 2040 Approx **$29** billion

Total up to 2050 Approx. **$69** billion

From METI, R&D and Social Implementation Plan

This project is basic research by academia + joint development at furnace manufacturers and users working in an R&D system to lead to social implementation

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Realize decarbonization plus added extra benefits with ammonia, hydrogen and electrification

Our Technology and Know-how

【Applicable Technologies】

Flame-Retardant Fuels Low-NOx Waste Heat Recovery Reforming Gas

Know-How in Reheating furnace CAL, CGL

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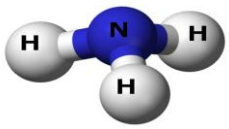
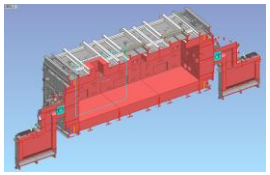
Induction Heating Electromagnetic Field and Heating Simulation

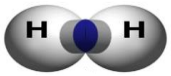
FY2023 FY2026 FY2029 FY2031

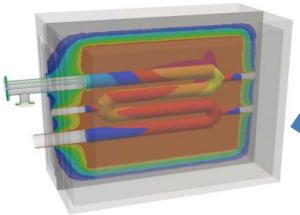
Ammonia Combustion





Hydrogen Combustion

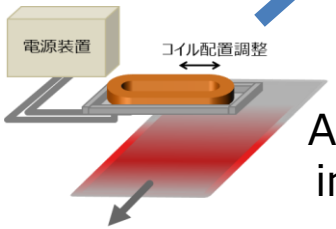




Reheating Furnace

FY2023 FY2026 FY2029

Transverse-Type Induction Heating



Annealing furnace in processing line

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Challenges for Social Implementation of Ammonia as Fuels for Industrial Furnaces

Combustion technology challenges

①**Stable combustion technologies** (Co-firing, catalysts, control, etc.)

②**NOx reduction technology** (Thermal NOx, Fuel NOx, reduction combustion)

③**Investigation of the impact on equipment components and product quality** (Nitridation, Corrosion, Degradation)

④**Development of affordable sensors**(Flame detectors, exhaust gas analyzers)

⑤**To use safely**

(Risk mitigation, disaster response, abatement systems, regulations & standards)

Economic feasibility , Infrastructure challenges

①**Economic efficiency**

(fuel cost reduction, new manufacturing methods, policy support)

②**Infrastructure development** (large-scale stable supply network etc.)

Efforts toward Decarbonization Policies

What is Carbon Pricing?

➡A policy approach that puts a price on CO_2 emissions, encouraging emitters to take actions to reduce their emissions.

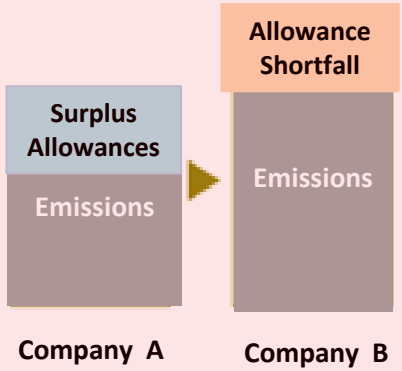
Pricing greenhouse gases → Promote emission reductions → Improving the global environment

Source: Asahi Shimbun SDGs ACTION!, "What is Carbon Pricing?" https://www.asahi.com/sdgs/article/14650075 (2025-08-24)

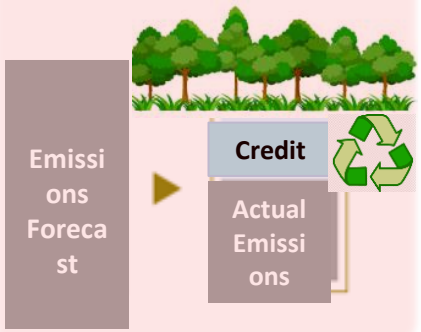
● Main activities

①Carbon Tax

②Emissions Trading



③Credit Trading



④Support Focusing on Price Differences

⇒This leads to specific initiatives for future technological development and social support.

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Thank you !