KUALA LUMPUR 2012 WORLD GAS CONFERENCE

25th world gas conference

"Gas: Sustaining Future Global Growth"

DEVELOPMENT OF HIGH PERFORMANCE AND HIGH ENERGY SAVING SYSTEM FOR INDUSTRY FURNACES

By: Masaya Kondo

Energy Engineering Dept.

Osaka Gas Co., Ltd., Japan

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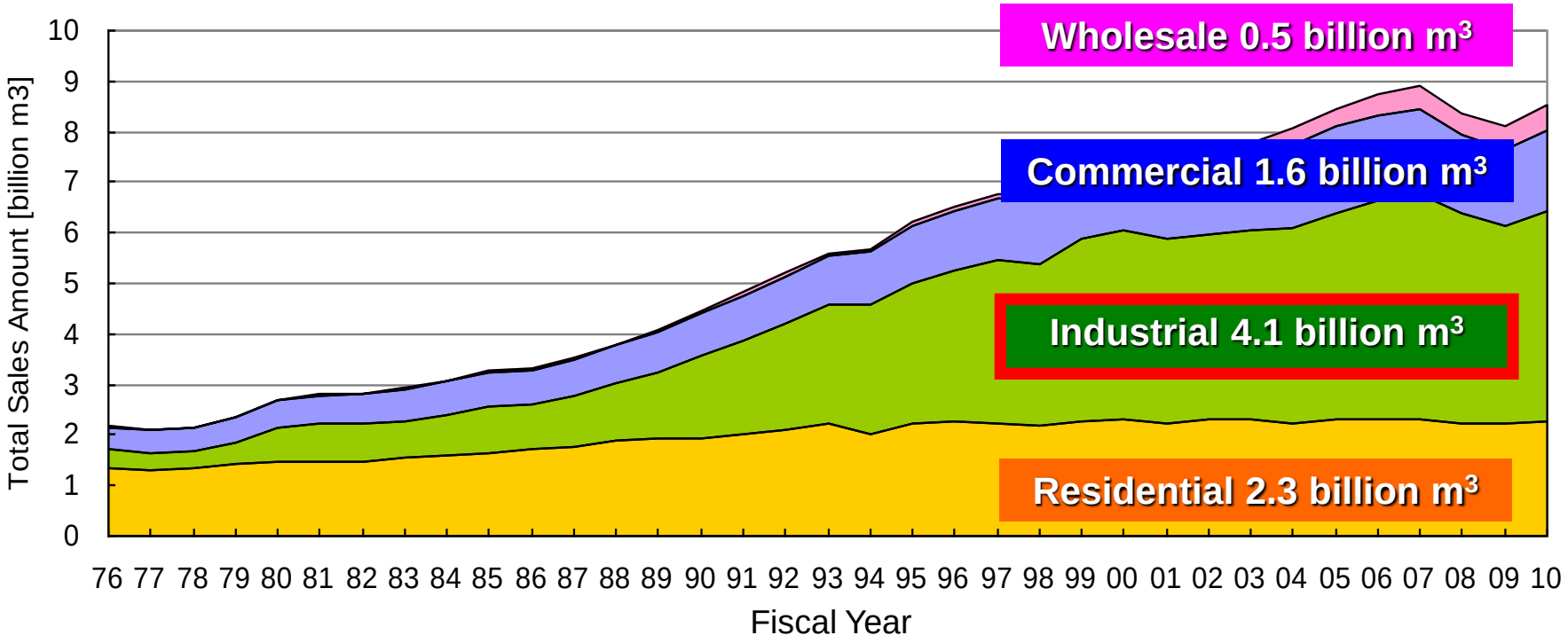
Contents

Why do we develop technologies of gas applications?

◆ Osaka Gas Total Sales Amount

➢ Recent 20 years, it has been expanding for industrial field.



➢ Fuel oils are mostly used, because of the high price of natural gas.

➢ it is necessary to differentiate natural gas from low-priced fuel oils.

➢ We provide solutions to our users' problems.

➢ We offer energy saving measures and ways to make users' facilities more sophisticated.

Contents

1. Introductions

2. Energy Saving System

- ✓ **Regenerative Burner System**
- ✓ “eREX” Burner (Enhanced Recuperative Burner)

3. High Performance Controlling System

- ✓ “Impulse Burn System”

4. Conclusion

Our Line-up of Technologies of Energy-saving Systems

◆ Conventional

Exhaust Heat Recovery Systems

- ➢ Heat Exchanger
- ➢ Recuperative Burner

◆ High Performance

Exhaust Heat Recovery Systems

- ➢ ***"eREX"-type*** Recuperative Burner

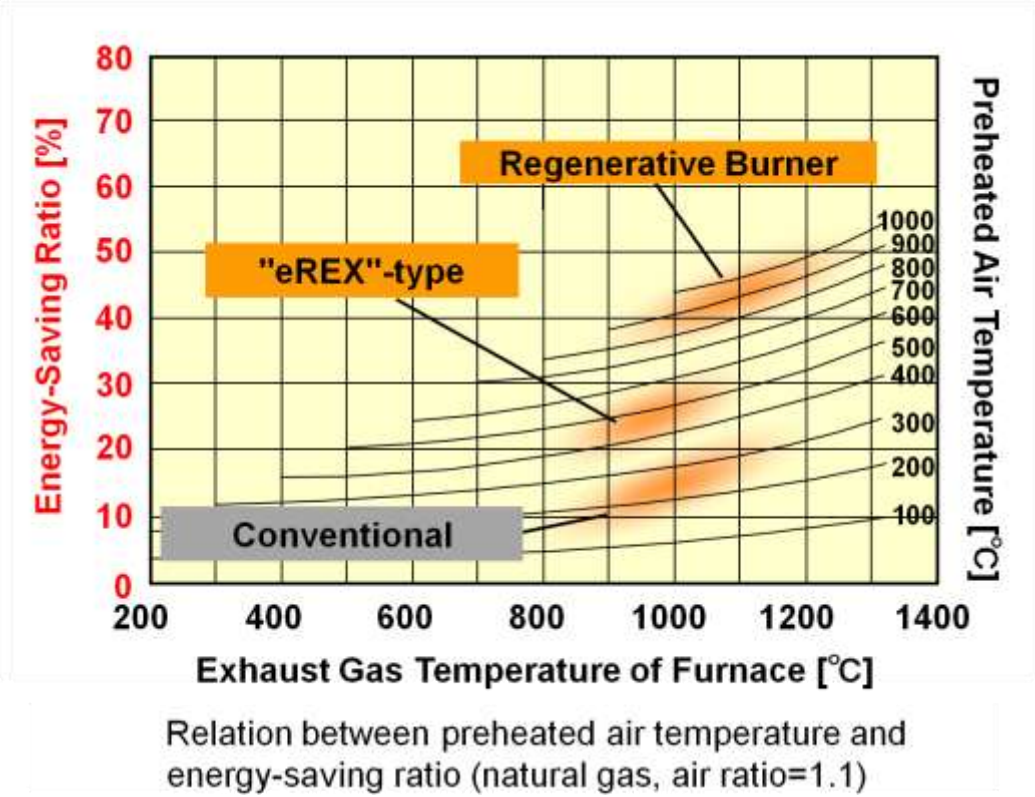
(Joint Development with Chugai Ro Co., Ltd.)

for 1,000˚C and lower,

the effect of cost-saving is small

◆ Best Efficiency Systems

- ➢ ***Regenerative Burner*** System



Relation between preheated air temperature and energy-saving ratio (natural gas, air ratio=1.1)

We propose an optimal system according to the requirements of our customers.

[Energy Saving Technology I]
Developments of Regenerative Burner System

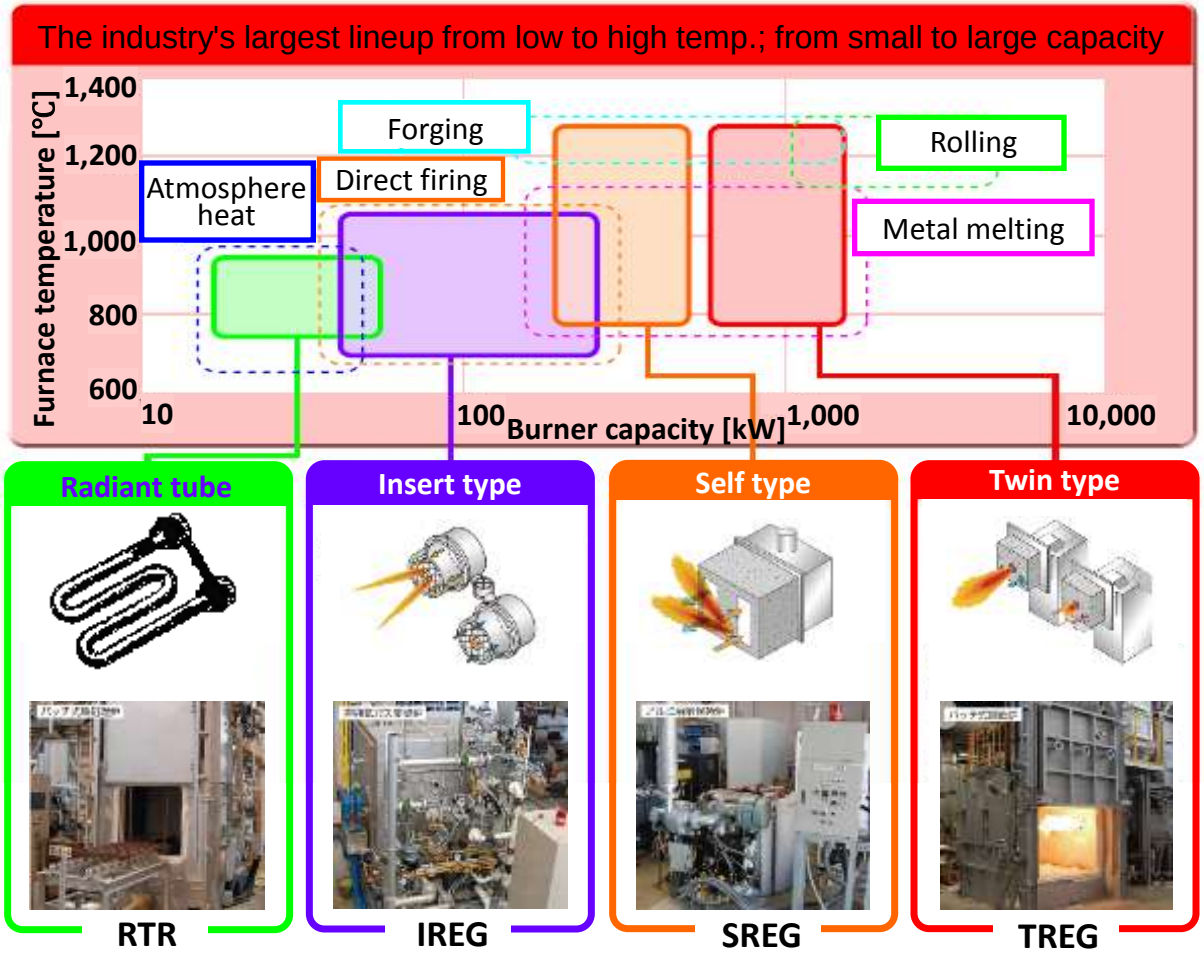
◆ **Lineup**

- ➢ Twin type (“TREG”)
- ➢ Self type (“SREG”)
- ➢ Insert type (“IREG”)
- ➢ Radiant tube type (“RTR”)

30-50% energy-saving

◆ **Main emphasis by Osaka Gas**

- ➢ ***Low capacity***
- ➢ ***Small size***
- ➢ ***Low cost***
- ➢ ***A lineup of versatile models***



General targets of Regenerative burner are big capacity and high temperature, so we independently have developed them.

Contents

1. Introductions
2. Energy Saving System
   - ✓ Regenerative Burner System
   - ✓ **“eREX” Burner (Enhanced Recuperative Burner)**
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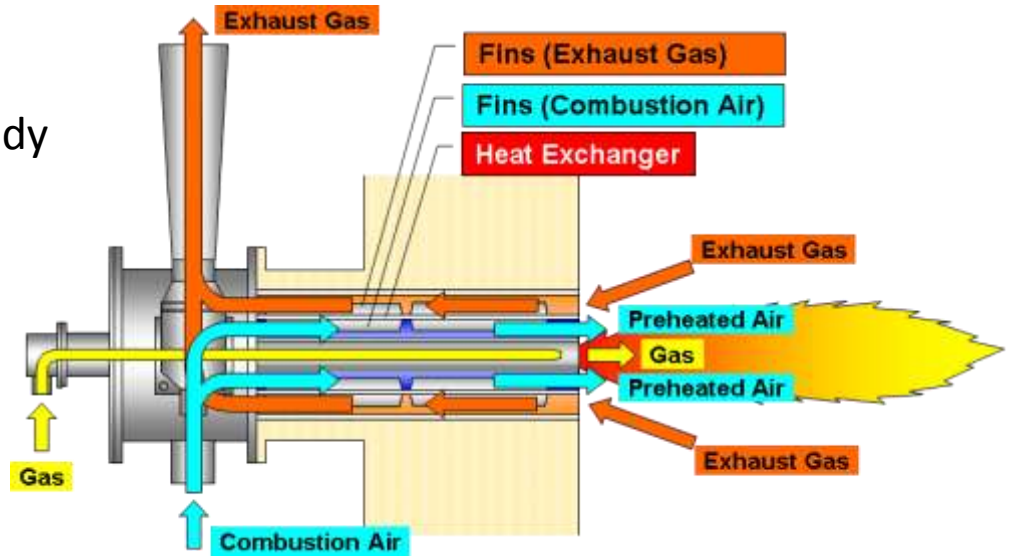
[Energy Saving Technology II]
Development of “eREX” Burner

◆ **Structure**

- Heat exchanger is built in the main body around the gas lance.
- Heat exchanger is used fin-type for high-efficiency.



◆ **Features**

- ***More efficient than traditional***
- ***Small size***
- ***Low NOx emission***
- ***High air-stirring performance***

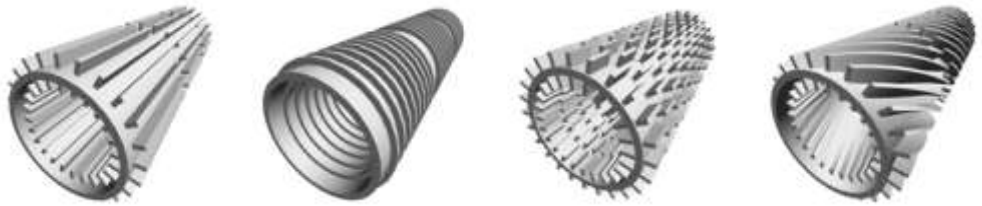
[Energy Saving Technology II]
Development of “eREX” Burner

◆ Application of simulation technology

Numerical simulations of thermal hydraulics were carried out to design optimal shapes of the heat exchangers.

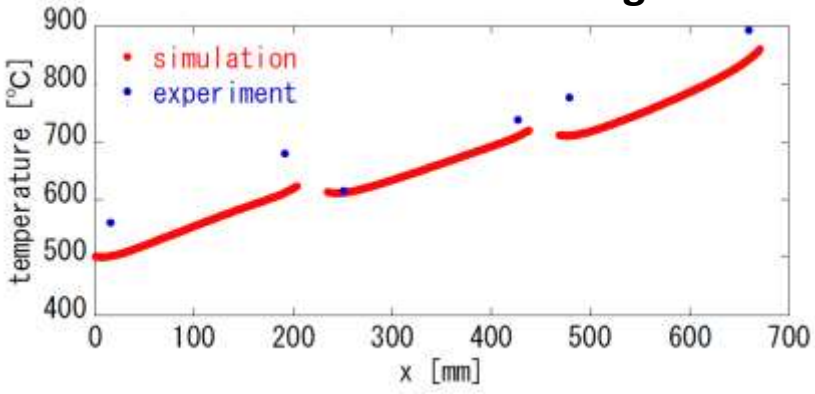
Conditions of optimal heat exchanger

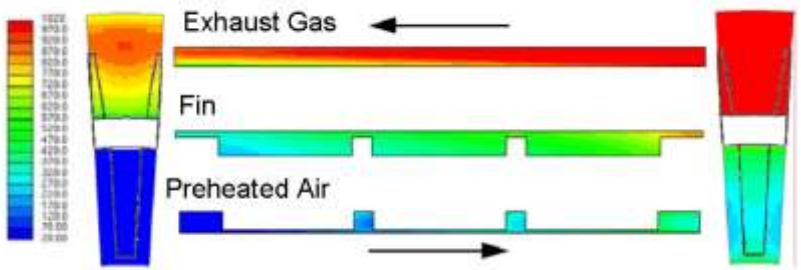
- ➢ High heat exchange efficiency
- ➢ Low pressure loss
- ➢ Low cost manufacturability



Examples of devised heat exchangers

◆ Verification of temperature of heat exchanger fin





Temperature distribution simulation

Contents

1. Introductions

2. Energy Saving System

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   ✓ **“Impulse Burn System”**

4. Conclusion

Enhancing The Performance For Industry Furnaces

- **"Impulse Burn System"**
  - An enhanced high-performance system that excels at controlling the temperature distribution within a furnace

    → Improvement of productivity

- **"Easy-Burner-Control" ("EBC") System**
  - precise air ratio to burners automatically

    → Saving energy, cost and maintenance

- **"EcoMelter"**

  (Cast-iron pot melting furnace with regenerative burner)
  - The life span of pot is extended.

    → Saving cost and maintenance

In this presentation, we will explain "Impulse Burn System".

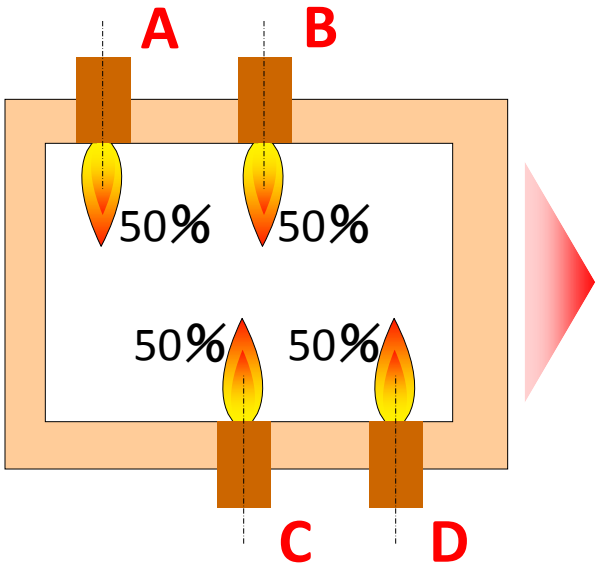
"EBC" Unit

"EcoMelter"

[Enhancing The Performance Technology]
Development of “Impulse Burn System”

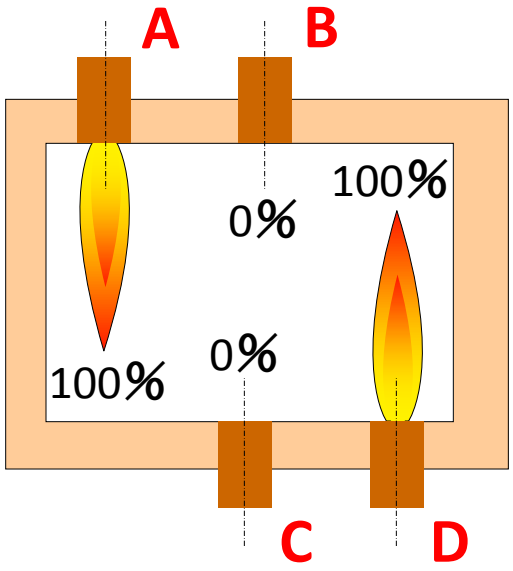
◆ “Impulse Burn System” makes ***the uniform furnace temperature distribution*** with the ***high-speed burners*** and ***flexible time proportion controlling***.

Typical one



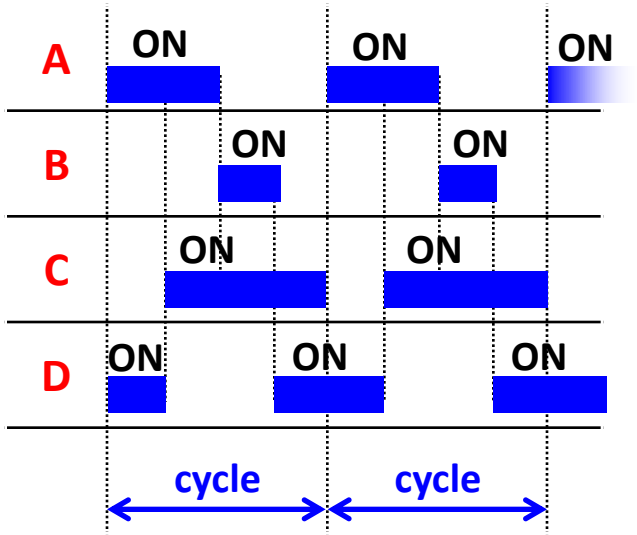
▲57 [℃]

Impulse Burn System



▲12 [℃]

Time table (50%)



Flexible Set Up

Contents

1. Introductions
2. Energy Saving System
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Conclusions

- **Developments Of Regenerative Burner System**
  - ***Best energy saving system***
  - ***Development of independent category***

- **Development Of "eREX" Burner (Enhanced Recuperative Burner)**
  - ***Intermediate-performance among our existing systems***
  - ***Optimal for 1,000˚C or less***

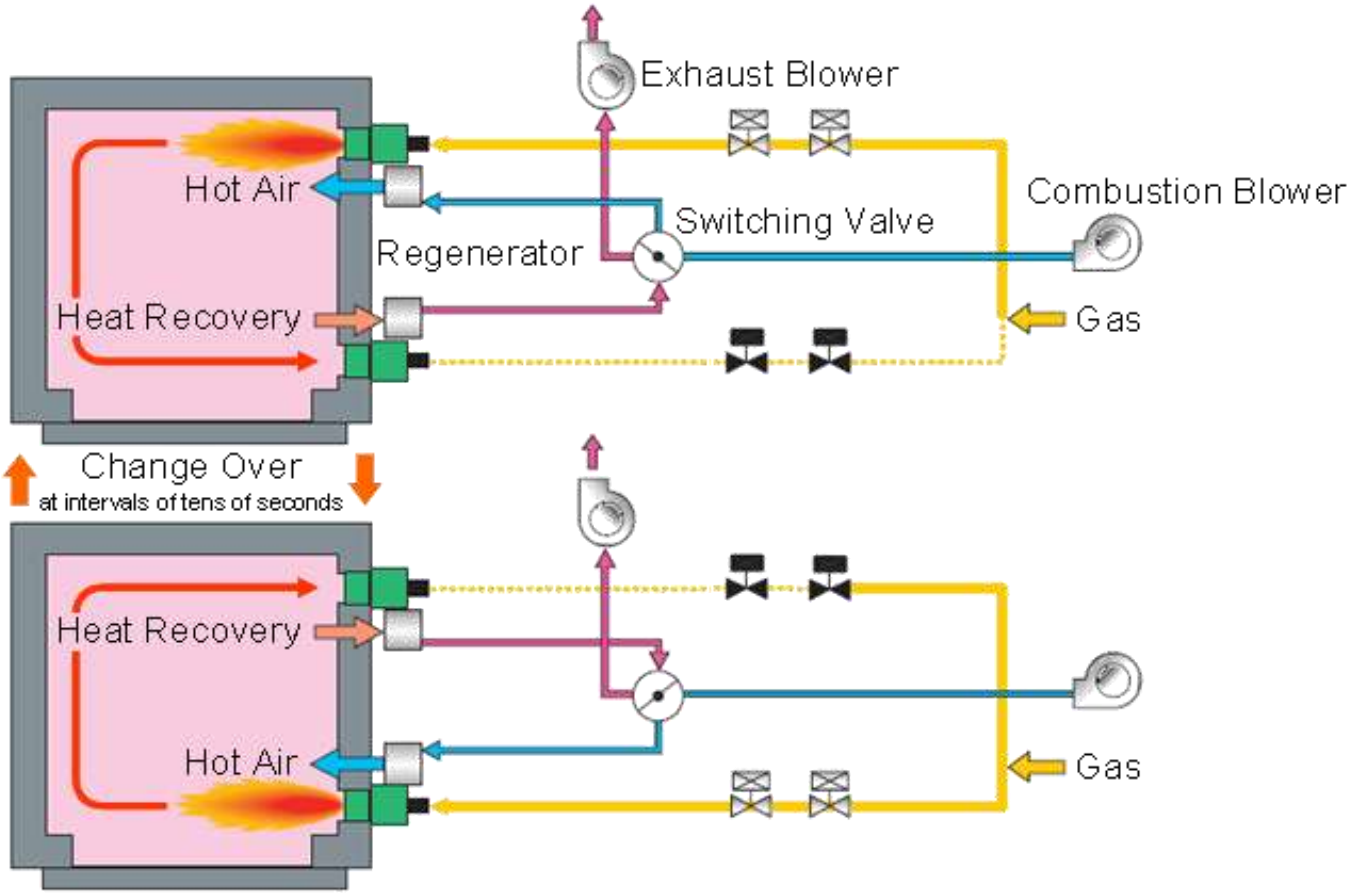
- **Development Of "Impulse Burn System"**
  - ***Development of controlling system, not only burners***

We are now able to meet the diverse needs of our customers.

Thank you for your attention.

[Energy Saving Technology I]
Developments of Regenerative Burner System

- **Two burners make combustion alternately at *intervals of several tens of seconds.***
- ***Preheated air with high temperature*** **is produced by regenerative heat exchange.**



[Energy Saving Technology II]
Developments of “eREX” Burner

◆ **Specification**

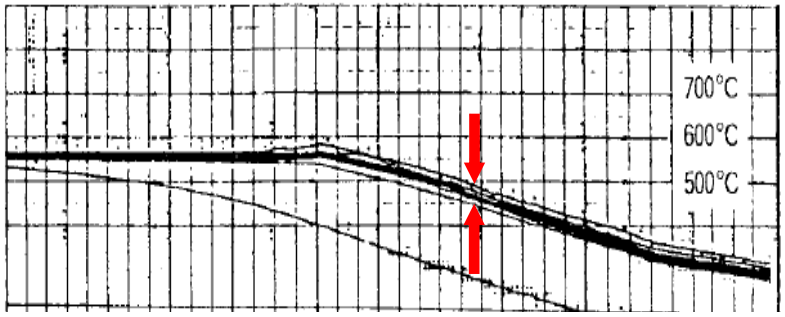
Firing Rate	145 [kW]（LHV）
Max. Furnace Temp.	1,000 [°C] (at the inlet to the heat exchanger)
Preheated Air Temp.	above 500 [°C]
Exhaust Gas Temp.	about 600 [°C]
NOx	below 50 [ppm] (converted to the O_2 concentration of 11%)
Combustion Gas Velocity	80 [m/sec]

Target is heat treatment furnaces or the like where a strict condition must be met as to the temperature distribution inside the furnace.

[Enhancing The Performance Technology]
Development of “Impulse Burn System”

◆ Improved Performance

	Existing system (proportional control)	Impulse Burn
Fuel	Oil	LNG
Processed volume [t/ch]	24.5	25
Temperature distribution [°C]	±57	±12
NOx [ppm]	210	50
Consumption rate [kWh/t]	248	181



Temperature distribution with IBS