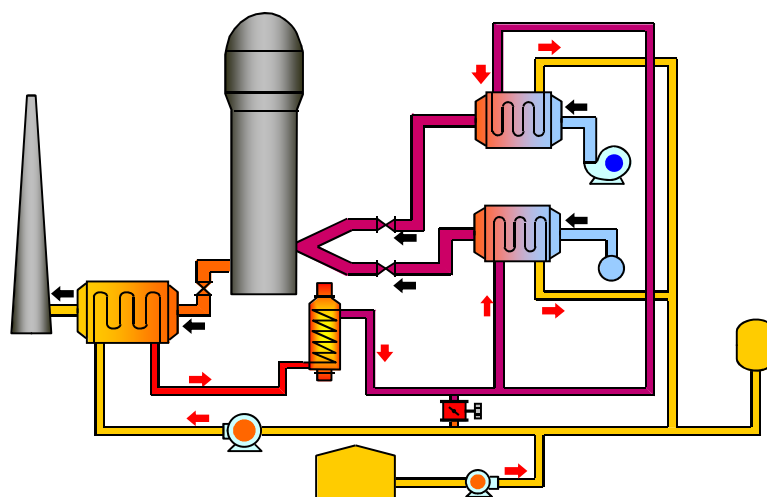


# Waste Gas Heat Recovery System



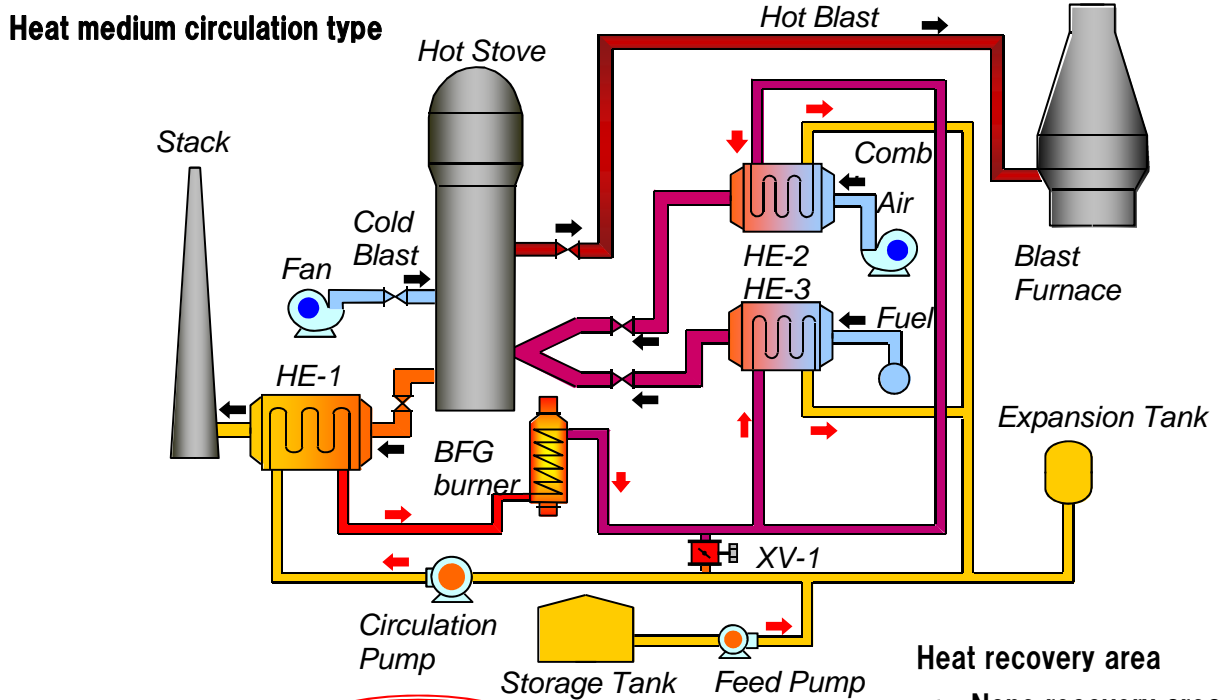
## Waste Gas Heat Recovery System

### 1. What is W. H. Recovery

This is a system to preheat the combustion gas and combustion air by recovering the combustion waste heat from hot stove.

- ⇒ Case-1: Reduction of high-calorie fuel gas consumption in hot stove.
- ⇒ Case-2: Reduction of FR by raising the blasting temperature to blast furnace.

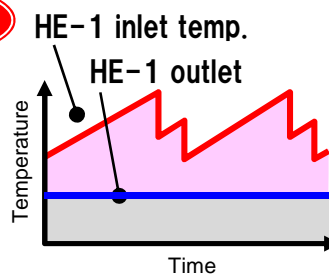
### 2. Nippon Steel & Sumikin Engineering Type W. H. Recovery System



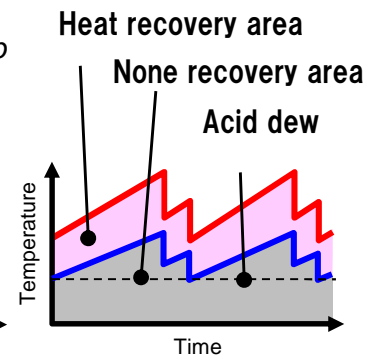
**Fuel :40% DOWN  
by installation**

#### High-efficient heat recovery

Flow regulating valve (XV-1) enables to control HE-1 outlet temperature over the acid dew point temperature all the time, making it possible to recover heat that can not be recovered by other type.



**NSENGI type**



**Other type**

#### Only BFG combustion

Heat medium after flue gas heat recovery can be heated by BFG burner, and fuel gas and combustion air of hot stove can be preheated to 200°C or higher.

#### High-free layout

Since each heat exchanger is simply connected by small-diameter heat medium piping, there is less restriction on the installation of equipment and installation at a narrow space is possible.

#### Easy maintenance

Since the organic heat medium is strong against thermal deterioration and freezing, it does not need replacement (actual result: over 10 years of use without replacement). Element can easily be detached: as a result, acceptable interval of element washing is once several years.

## Waste Gas Heat Recovery Furnance

### 3. Comparison of heat recovery system

heat recover amount:  
Heatpipe ratio 10~15%UP

	Heat medium circulation type (Nippon Steel & Sumikin Engineering type)	Heat pipe	
		Integral type	Separate type
Installation of the BFG burner for additional heating up	<b>Possible</b> (No restrictions)	<b>Possible</b> (Big burner is required in order to heat up of flue gas)	<b>Possible</b> (In order to heat up of steam, there are layout restrictions)
Restrictions for heat exchanger installation	<b>No restrictions</b>	<b>With restrictions</b> Up side : HE for preheating of fuel gas and combustion air Down side : HE for heat recollection of flue gas	<b>With restrictions</b> (The distance and the height between heat exchangers have restrictions)
Modification of large caliber duct	<b>Not necessary</b>	<b>Necessary</b>	<b>Not necessary</b>
Measure against acid corrosion (HE-1)	<b>Possible</b>	<b>Impossible</b>	<b>Impossible</b>
Leakage detection of heat medium	<b>Easy</b>	<b>Difficult</b>	<b>Difficult</b>
Heat medium	Organic heat medium (It is stability under high temp. for a long period. Then, <b>special management is unnecessary.</b> )	Pure water <b>(Periodical charge is required)</b>	Pure water, soft water <b>(Periodical charge is required)</b>
Heat recovery	<b>10~15% UP</b> Adaptable heat recovery ⇒ No design restriction of min. waste gas temperature	<b>(Base)</b> Un-adaptable heat recovery ⇒ Design restriction of min. waste gas temperature	

### 4. Actual Result (ArcelorMittal Aço Longo)/Brazil

Case-1 In case of the HS fuel rate decrease

	Before	After installation
BFG rate (*1)	51,900 Nm <sup>3</sup> /hr/HS at 35°C	75,061 Nm <sup>3</sup> /hr/HS at 250°C
<b>LPG rate</b>	<b>1,120 Nm<sup>3</sup>/hr/HS</b>	<b>0 Nm<sup>3</sup>/hr/HS</b>
Combustion air rate	69,000 Nm <sup>3</sup> /hr/HS at 45°C	53,492 Nm <sup>3</sup> /hr/HS at 250°C
Waste rate	117,080 Nm <sup>3</sup> /hr/HS at 320°C	118,800 Nm <sup>3</sup> /hr/HS at 320°C

\*1 ; BFG calories ; 796

Case-2 In case of the blast temp. rise (Approx. +100 °C )

• Decrease of FR ; **Approx.10~15kg/t**

### 5. SUPPLY RECORD

#### Actual result of delivery : 33unit

\* Table below covers the latest 10 cases.

	No.	Year (Order)	Country	Customer	Contents	Remarks
W.H. Recovery System	1	1993	Korea	Pohang Iron & Steel	1 set	F BF
	2	1995	China	Laiwu Iron & Steel	1 set	2BF
	3	1995	Japan	Nisshin Steel	1 set	Kure 1BF
	4	1995	Japan	Nippon Steel	1 set	Nagoya 1BF
	5	2000	Korea	Pohang Iron & Steel	1 set	Kwangyang 5BF
	6	2001	Japan	Hokkai Iron & Coke	1 set	Muroran 2BF
	7	2001	China	Handan Iron & Steel	1 set	5BF
	8	2004	India	TATA Steel	1 set	G BF
<b>Total 33 Unit</b>	9	2005	Brazil	Arcelor Mittal Aço Longo	1 set	A BF
	10	2007	Japan	Kobe Steel	1 set	Kakogawa 2BF