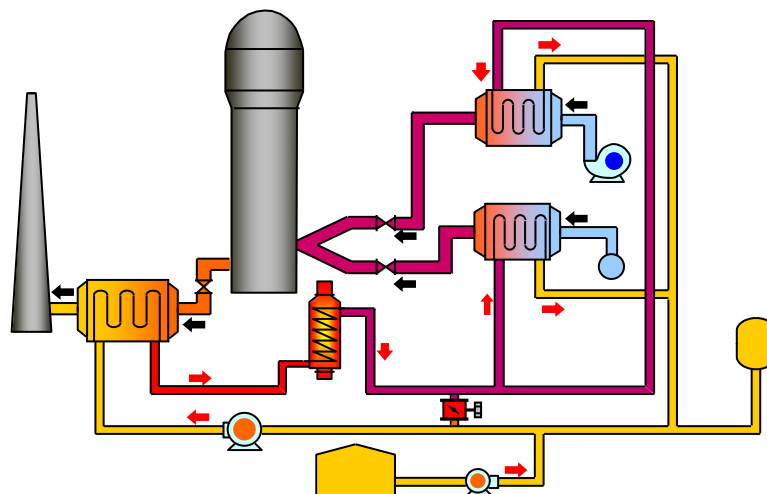


Waste Gas Heat Recovery System



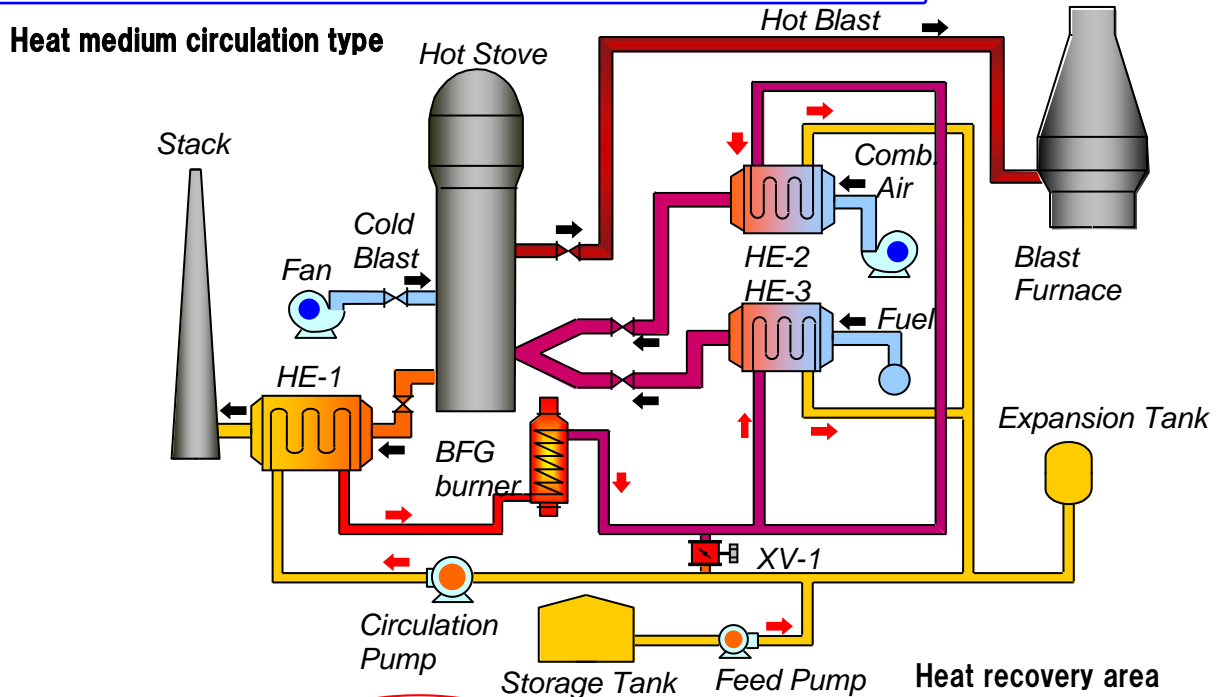
Waste Gas Heat Recovery System

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.**

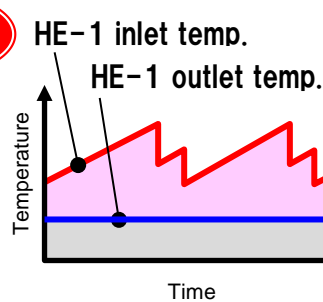
2. Nippon Steel Engineering Type W. H. Recovery



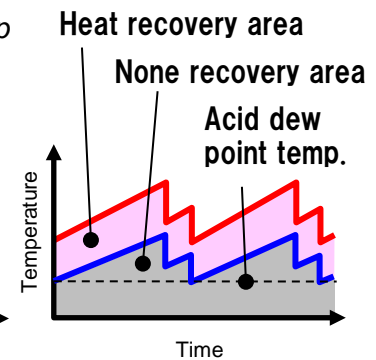
**Fuel :40% DOWN
by Installation**

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.



Our 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 recovered amount :
Heatpipe ratio 10~15%UP

	Heat medium circulation type (Nippon Steel Engineering type)	Heat pipe	
		Integral type	Separate type
Installation of the BFG burner for additional heating up	Possible (No restrictions)	Possible (Big burner is required in order to heat up of Flue gas)	Possible (In order to heat up of steam, there are layout restrictions)
Restrictions for heat exchanger installation	No restrictions	With restrictions Up side : HE for preheating of fuel gas and combustion air Down side : HE for heat recollection of flue gas	With restrictions (The distance and the height between heat exchangers have restrictions)
Modification of large caliber duct	Not necessary	Necessary	Not necessary
Measure against acid corrosion (HE-1)	Possible	Impossible	Impossible
Leakage detection of heat medium	Easy	Difficult	Difficult
Heat medium	Organic heat medium (It is stability under high temp. for a long period. Then, special management is unnecessary.)	Pure water (Periodical charge is required)	Pure water, soft water (Periodical charge is required)
Heat recovery	10~15%UP adaptable heat recovery ⇒No design restriction of Min. waste gas temperature	(base) 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 ³ /hr/HS at 35°C	75,061 Nm ³ /hr/HS at 250°C
LPG rate	1,120 Nm³/hr/HS	0 Nm³/hr/HS
Combustion air rate	69,000 Nm ³ /hr/HS at 45°C	53,492 Nm ³ /hr/HS at 250°C
Waste rate	117,080 Nm ³ /hr/HS at 320°C	118,800 Nm ³ /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 : 35unit

* Table below covers the latest 10 cases.

	No.	Year (Order)	Country	Customer	Contents	Remarks
W.H. Recovery System	1	1995	Japan	Nisshin Steel	1 set	Kure 1BF
	2	1995	Japan	Nippon Steel	1 set	Nagoya 1BF
	3	2000	Korea	Pohang Iron & Steel	1 set	Kwangyang 5BF
	4	2001	Japan	Hokkai Iron & Coke	1 set	Muroran 2BF
	5	2001	China	Handan Iron & Steel	1 set	5BF
	6	2004	India	TATA Steel	1 set	G BF
	7	2005	Brazil	Arcelor Mittal Aço Longo	1 set	A BF
	8	2007	Japan	Kobe Steel	1 set	Kakogawa 2BF
Total 35 Unit	9	2014	Japan	Nippon Steel& Sumitomo metal	1 set	Kokura 2BF
	10	2019	Japan	Nippon Steel	1 set	Kimitsu 2BF